The Analysis of Injury Presentations in Initial Entry Trainees at Fort Benning, Georgia

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The purpose of this research is to compare the effects certain risk factors have on injury presentation for basict rainees. Physical training related injuries are common in recruits during basic training, but little is known regarding the causation. The implications of these injuries on medical assets, lost training time, and total costs during a time when the military is expected to do more with less is staggering. In order to better understand some of the intrinsic factors that lead to injured trainees, this study prospectively surveyed two separate units during a 13-week basic-training cycle. Unit rosters were obtained from the units at the beginning of the training cycle, medical records were screened for demographic information not in the unit rosters. Potential risk factors(age, injury history, push-up score, run score, cumulative Physical Fitness Test score, overweight status, and race) were compared to injury presentation for the sample set (n = 309). Statistical analysis of the sample set shows that the only risk category that has a significant effect on injury presentation is the Hispanic race, with r = .1321, ?2(1) = 5.390, and p = .020. Monitoring this category of trainees more closely for early signs of potential injury may reduce the number of trainees being injured during basic training at Fort Benning.

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Abstract

The purpose of this research is to compare the effects certain risk factors have on injury presentation for basic trainees. Physical training related injuries are common in recruits during basic training, but little is known regarding the causation. The implications of these injuries on medical assets, lost training time, and total costs during a time when the military is expected to do more with less is staggering. In order to better understand some of the intrinsic factors that lead to injured trainees, this study prospectively surveyed two separate units during a 13-week basic-training cycle. Unit rosters were obtained from the units at the beginning of the training cycle, medical records were screened for demographic information not in the unit rosters. Potential risk factors (age, injury history, push-up score, run score, cumulative Physical Fitness Test score, overweight status, and race) were compared to injury presentation for the sample set (n = 309). Statistical analysis of the sample set shows that the only risk category that has a significant effect on injury presentation is the Hispanic race, with $\underline{r} = .1321$, $\chi^2(1) = 5.390$, and $\underline{p} = .020$. Monitoring this category of trainees more closely for early signs of potential injury may reduce the number of trainees being injured during basic training at Fort Benning.

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*SPSS: Statistical Package for the Social Sciences

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[2]Final Study

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Introduction

Background

Although the military continues to draw down on the number of active duty soldiers, the missions placed on the military have not lessened. This requires that all military assets be maximally utilized. The mainstay military asset that is relied upon to complete these missions is the soldier. Training soldiers to perform the military mission with limited resources is vital. Injuries can affect the training efficiency of the individual soldiers, by reducing the amount of time a soldier has to train. Kaufman, Brodine, and Shaffer (2000) found that training time lost by trainees due to injury varied by the type of injury; fractures accounted for the highest number of lost days (103.2 days/injury) followed by sprains (16.7 days/injury). Occasionally, injuries can result in a soldier not being able to complete training. This can result in a significant loss of dollars for the government. The failure of a single soldier to complete training at Fort Benning, Georgia represents a cost of about $16,000 to the government (Snoddy & Henderson, 1994). Although injuries during training cannot be completely avoided, if risk factors for injuries can be identified and monitored, then the frequency of injuries may be reduced. This would result in more efficient training for our soldiers.

Conditions which prompted the study

The Basic Combat and Infantry Training Brigades' injury

presentation rates have been high which has caused an increased workload at the two supporting clinics (Troop Medical Clinics 5 and 7). The increased workload has placed severe constraints on already short-staffed clinics. This staffing shortage also results in large amounts of lost training time for the trainees. Some of the steps that were taken to try to reduce the volume of patients that were presenting at the two Troop Medical Clinics (TMCs) were to expand the duties of the dedicated family practice clinic (Winder Health Clinic) located in the same area (Sand Hill). Winder took on the additional responsibility of providing sick call prior to their regularly scheduled family practice clinic. This action was expected to provide some relief for the TMC staff, in addition to reducing the amount of time it took to return the trainees to training.

Sick call presentation is comparatively low Monday through Friday when compared to the extremely high presentations on Saturday. Additionally, weekend sick call has been increasing with a high of 437 patients arriving for sick call on 30 September 2000. There has also been an increase in the number of stress fractures associated with the increased sick call rates. A high of 10 patients, summarily diagnosed with stress fractures, was seen on 30 September 2000. One of these patients was diagnosed with bilateral stress fractures. The initial indication appears to be that training, or the fear of being recycled due to lost training time, has a higher priority than seeking prompt medical care.

In a continued attempt to reduce the stress on the short-

staffed clinics and return the trainees to duty quicker, the clinics sent medics forward to the aid stations. These medics screened patients coming into the aid stations and returned to duty those trainees that were minimally sick, ill or injured and gave sick call appointments, at the clinics, for those patients that were non-emergent and needed to see a provider. The clinics felt the benefit realized (reduced workload and trainee return to training time) would far outweigh the cost of the additionally reduced staffing. Although, the initial indication is that the volume of patients has decreased slightly there is still a high injury presentation rate. A process currently being considered is to implement “specialty sick call.” This would potentially reduce the return to training time for trainees; the specialty clinics, at the hospital, would reserve the first two hours for trainee referrals. The thought being that if we can reduce the return to training time for these trainees then injured trainees would come in earlier and get more preventive treatment than rehabilitative treatment. This would have a secondary effect of reducing the workload on clinic providers, as less definitive care would be needed to treat them.

Approximately 50 percent of the injuries presenting to the clinics have complaint durations greater than four days. There are eight Training Battalions: three are Basic Combat Training Battalions and five are Infantry Training Battalions. These eight Training Battalions are made up of 40 companies. In a one day snapshot of sick call rates, the indication was that greater than 50% of the injuries were assigned to six of those 40

companies.

Winder Health Clinic is a Family Practice clinic, staffed by six physicians and one nurse practitioner. The nurse practitioner is also the head nurse, reducing her ability to provide patient care; her Full Time Equivalency (FTE) is less than half. Winder sees a full schedule of patients (Active Duty, Dependents, and Retirees) from 0900 to 1630. Sick call patients at Winder come to the clinic, during the week, in two waves; one at 0700 and one at 0800-0830. The time it takes to see these patients differs based on presentation times, complicating the training time missed. TMCs 5 and 7 see the remainder of the trainees. Two Physician Assistants (PA) staff each of these clinics. The combined total provider staffing level is 10.5 FTEs. These providers currently care for 7,876 trainees in addition to the regular family practice patient load.

Current issues include no current surveillance system to monitor injury rates; no current mechanism to provide feedback to the units on their individual injury rates; and no mechanism to indicate risk factors for injury susceptibility.

Statement of the Problem or Question

Injuries to soldiers are serious problems from a medical as well as a readiness perspective. Injuries to our basic trainees, at Fort Benning, are a part of this problem that is not well understood. Some of these injuries, though preventable, still occur. With no surveillance or feedback to the units we do not know what the unit specific rates of injury are nor do we know what may be the cause of this rate. Without this information we

cannot control the rate of injuries nor can we initiate a process to prevent them. The main question that this research hopes to answer is what factors do we need to follow in order to reduce a unit's injury rate for basic trainees at Fort Benning?

<u>Literature Review</u>

Although the injury rate of Initial Entry Trainees (IET) at Fort Benning is not well understood, injuries attributed to military training have been studied and researched in all branches of the service. As well, injuries due to military training have been researched in many foreign forces. Within the Army there is a current research effort to determine injury rates in initial entry training. To begin to understand the magnitude of the problem Jones (1983) found that one in four trainees was injured during basic training. Another study found that the cumulative percentage of injuries to infantry trainees was 46% (Jones and Knapik, 1999).

The Directorate of Epidemiology and Disease Surveillance, in their mission to determine the health and fitness of America's Army, is focusing on identifying and evaluating obstacles to medical readiness. Within this there is special focus on the control and prevention of injuries to initial entry training; physical fitness is a significant part of readiness and therefore a significant part of initial entry training. Fort Jackson is the site where this research is being conducted currently with the desire to look for information at other sites.

In November 1996 the Armed Forces Epidemiological Board

(AFEB) issued a report that cited injuries as the leading cause of morbidity and mortality among military service members. Overall injuries have the largest impact on the military in terms of hospitalization. This population of soldiers accounts for the largest direct cost of medical care, the largest number in the disabled population, and the largest impact on readiness. Approximately 53% of all soldier disabilities are due to injuries (Jones and Knapik, 1999). As well, hospital records indicate that injuries have a bigger impact on the health of service members than does any other Principal Diagnostic Group (Smith, Dannenberg, and Amoroso, 2000). In a time when it is difficult to maintain enlisted strengths the implications of these injury rates on the military, in terms of attrition and training costs, is staggering. The Department of Defense estimates the cost to train a recruit at $25,000 (Cox, Clark, Li, Powers, and Krauss, 2000). The leading cause of death for military soldiers each year is also due to injuries, accounting for four out of five deaths (Powell, Fingerhut, Branche and Perrotta, 2000). With these statistics, the identification, control and prevention of injuries require more attention.

Soldiers must develop and maintain high levels of physical fitness for the demanding tasks they perform in the military. However, the routine activities that they must perform to maintain this level of fitness lend themselves to training-related injuries. The primary physical stress on trainees in basic training is aerobic weight-bearing activity such as walking, marching, and running. On average, 25% of enlisted

recruits sustain one or more injuries during initial entry training (Piatanida, Knapik, Brannen, and O'Conner, 2000). Studies have shown that the highest rate of injuries during initial military training occurs during the first weeks of training. Henderson, Knapik, Shaffer, McKenzie, and Schneider (2000) found that injury rates for basic trainees progressively increased during the first three weeks of training, peaking in the third week and then declining to about 2-3 injuries per 100 soldiers per week. These training injuries were also noted as increasing along with the increased volume of physical activity. Deuster and Jones (1997) found that the highest rates of injury occurred in the first several weeks of training with sprains to the ankle or knee as the most common injury. Another study found that 82% of all training injuries during basic training were attributed to lower extremities (Almeida, Williams, Shaffer, and Brodine, 1999), injuries to the ankle/foot region being the most common. Almeida et al. found that the abrupt increase in physical activity was a significant contributor to injury risk.

Some contributing factors to injury rates can be linked to current physical fitness, previous sports activity, and previous injury history. One study found that during Marine Corps recruit training, soldiers with blisters were 50 percent more likely to experience additional training related injuries (Bush, Brodine, and Shaffer, 2000). Other studies have also shown that the risk of additional injuries is significantly higher for soldiers who were previously injured. Schneider, Bigelow and Amoroso (2000) found that a history of previous injury produced a seven-fold

increase in the risk of recurrent injury to basic trainees. This information may indicate that there may need to be a change in how soldiers are evaluated and/or managed, from a medical standpoint, to decrease the risk of subsequent injury. A trainee suffering a recurrent injury within six months of entering Active Duty can lead to a discharge. This discharge will be classified as a condition that existed prior to service (EPTS). After six months the soldier must go before a formal board prior to discharge. The Department of Defense found that in 1995, of 153,228 recruits for the combined services, 5% had a recurrent injury within six months leading to an EPTS discharge. The cost to the government for the loss of these soldiers was approximately $200,000,000 (Cox et al. 2000).

Stress fractures are one of the leading lower extremity injuries for initial entry trainees. Stress fractures are fractures to healthy bones caused by mechanical stress without acute trauma. Usually this occurs as a result of repeated, prolonged, rhythmic load (Ivanovski, Medjedovic, and Perisic, 1998). Bone is stressed whenever it is subjected to a load. As a result of this stress bone will strain or change dimensions. At low levels the bone will rebound to original dimensions without permanent damage once the stress/load is removed. If the stress to the bone is greater than a certain critical limit then the bone will be damaged to the point where continued stress/load on the bone will lead to a stress induced fracture (Scully and Besterman, 1982). To get a better understanding of how healthy bones can fracture without trauma it is necessary to understand

the processes that bones go through under stress. Stressed bones are damaged in the area of specific stress; this “damaged” bone is removed in a process called osteoclastic resorption leaving microscopic holes in the bone. These holes in the bones are then replaced during a process called osteon maturation. This process is augmented with additional bone formation in a process of periosteal and endosteal lamellar bone depositions (Scully and Besterman, 1982). This new bone is better able to withstand physical stress. The removal of stressed/damaged bone is a rapid process within the body, but the replacement/repair process is a fairly slow process (Garcia, Grabhorn, and Franklin, 1987). In layman’s terms stress reactions and fractures occur when stress-induced damage and resorption of damaged bone exceeds the bone’s capabilities to repair it. These types of fractures usually appeared during the first 30 days of initial training. Of all the training, marching had the biggest influence on these types of injuries (Ivanovski, et al.). Again, current and past physical fitness/activity can be attributed to the likelihood of a trainee getting injured. Two independent studies of initial entry trainees indicated that the type of physical activity the recruit was involved in prior to entry was a factor for injuries. Though there was no significant reduction in risk for injuries in recruits who were runners, there was a significant reduction in risk for individuals who played a ball sport (Milgrom, Simkin, Eldad, Nyska, and Finestone, 2000). The high strain rates that occur in these types of sports was better preparation for the type and level of activity found in initial

entry training. The time frame for this training was also found to be significant. Recruits that played a ball sport for six months prior to entry were found not to have any reduced risk for injury. A reduction in the risk for injury was found in recruits only after playing the sport for two years (Finestone, Eldad, and Milgrom, 2000).

The US Army Center for Health Promotion and Preventive Medicine (CHPPM) has determined that surveillance to determine the size of the injury problem is most important in any attempt to control or prevent increased injury rates. This is in line with Public Health’s five steps to injury control (surveillance, research, intervention, implementation, and monitoring) (Jones and Knapik, 1999). Studies to determine causes and risk factors for injuries are the next important issue. The success of any injury prevention program, though, depends on a partnership between the medical community and the commanders; commanders and other decision makers are the only people who can direct actions to prevent these injuries. CHPPM has indicated that limiting running distances can reduce the risk of stress fractures in recruits. Formal pre-training conditioning programs can also reduce injury presentation rates during initial entry training (Lee, Kumar, Kok, and Lim 1997). This pre-training was better reducing injury rates than was a slower pace of training by extending initial entry training by one month (Lee, et al.).

Previous methods of research include random sampling of recruits who arrived for boot camp and were then followed prospectively through their 12 weeks of training for injury

outcomes. These results were then compared to weekly volumes and types of training. Other studies involved analyzing all outpatient visits for trainees during a six-week period of training for rate, type and risk of injury. Additionally, some research included recording individual demographic information on recruits prior to a five-day, 100-mile ruck march (Reynolds, White, Knapik, Witt, and Amoroso, 1999). Along with a health assessment questionnaire, injury information was analyzed. Fort Bliss took six basic training companies and had some refrain from running during the second, third, and fourth week of training (Popovich, Gardner, Potter, Knapik, and Jones (2000). The injury rates of the resting companies were then compared to the non-resting companies in order to determine the effects of rest on injury rates. The Directorate of Epidemiology and Disease Surveillance has been conducting research at Fort Jackson since 1997. Their research is a joint venture with other sections of CHPPM, Fort Jackson, and the U.S. Army Fitness School. This venture has begun to prove successful, as they have begun to see a decrease in the injury presentation rates.

Purpose

The primary purpose of my study is to provide feedback information to both the line commanders and medical decision-makers so that changes may be made to reduce the injury presentation rates at Fort Benning. The secondary purpose will be to reduce sick call volumes at the TMCs by reducing injury rates; this will in turn provide a positive impact on their respective staffing. The dependent variable in this study will

be injuries and the independent variables will be the potential risk factors. These risk factors include individual demographic differences, fitness, and training. A soldier's injuries will be seen as a function of their individual risk factors. My hypothesis is that there are specific factors that are significant indicators for injury at Fort Benning. The information on these differences is what I will use to provide the aforementioned feedback.

Method and Procedures

The research subjects are initial entry trainees from two separate brigades. Fort Benning has two separate training environments: the Infantry Training Brigade (ITB) and the Basic Combat Training Brigade (BCTB). Within these two brigades are 40 separate companies. The actual number of trainees will be gathered from the individual brigades. Data on injury presentation will be gathered by ICD-9 (International Classification of Disease) codes. All characteristics of illnesses and injuries to humans have been individually broken out and given a specific code. These codes are used more specifically for billing purposes but will be used in this study to determine why a soldier is presenting for healthcare. This information will be gathered weekly from the hospital's available information systems. These systems will include the Composite Healthcare System (CHCS) and the Ambulatory Data System (ADS). The data will be gathered from the CHCS patient appointment file and linked to ADS diagnoses designated by the provider. Since the study is primarily concerned with injury

rates the data will be screened for all 800-995 ICD-9 codes. These codes identify all external injuries, poisons and toxic effects. These data will include individual demographic data as well as company assignment. Since all trainees at Fort Benning are male no gender identification will be used. The injury presentation data will be used in totality; no sampling will be conducted. Additional demographic data (age, fitness levels, and previous injury exposure) will be taken from individual records. After conversing with the units on all the features of this project and in ethical consideration for the trainees anonymity was assured. All trainee specific information (name and SSN) will be coded to protect the trainees' identity; trainees will be assigned a unique alphanumeric code to protect their identity. All names and social security numbers will be purged prior to analysis.

The individual brigade data will be gathered from the brigade's manning rosters and accounts for each individual trainee. The data are updated on a daily basis so that there are no repeat entries or unaccounted entries. The brigade data will be reliable and valid. The exportation of these data from the unit's software program to a Microsoft program may cause some of the data fields to be filled with corrupt or blank data. These entries will be removed. Due to staffing constraints and scheduling issues, no patient is seen without first being put into the CHCS appointment system. This system is also used to continually monitor and report workload productivity. Due to the continual observation on this system it will be considered

reliable. Information from the ADS system will be a reflection of the CHCS appointment system and is currently being monitored for compliance. This system will also be considered reliable. Coding of patient diagnoses is an issue. Wrong diagnoses are still found in the coding system. ADS validity, as a result, will not be 100 percent, but is expected to be highly valid. Coding errors that are found will be investigated using the patient's records and physician input.

My research project will use both qualitative and quantitative analyses. In the qualitative analysis I will conduct an observational study and issue analysis to determine the most common types of injuries sustained during training. Risk factors will also be determined using the demographic information and unit of assignment. I will also use this method to determine if there is a time during training that is a factor for injuries. Since there are different levels, types, and lengths of training done in these different training environments I will conduct a six-week surveillance on trainee injuries. I will use this information to identify where the majority of injuries are occurring and to help identify some potential risk factors. Since the surveillance will not observe a complete cycle of training some units may see higher rates of injuries based solely on the type of training being conducted at the time of observation. Though it will not observe a complete cycle data collected will still be used to identify which units to use for the final study, as well as potential risk factors to be studied. The quantitative analysis will be the main part of

my research. Once risk factors and test subjects are identified (age, unit of assignment, physical fitness, training, etc.), I will follow them through at least one complete training cycle. Physical fitness will be measured using the Army's physical fitness test scores. I will use the cumulative score as well as the individual aerobic score, to see if there one is a better determiner of injury. The week of training that a soldier presents with an injury will be used to test if specific training is a risk factor.

I will use both the Chi Squared and Discriminant Function Tests with an alpha probability set at the $\underline{p} = .05$ level to test my hypothesis; certain risk factors can contribute to injury occurrence. The dependent variable throughout the analyses will be injury; are the trainees injured? The answer will be coded 1 if "yes" 0 otherwise. The independent variables will be the individual risk factors. The independent variables will be tested individually to determine their independent level of significance.

Expected Findings and Utility of Results

What I expect to find is that there are significant differences in injury presentation rates based on different risk factors. Levels of fitness and previous injury exposure will also be seen as a contributing factor to injury presentation, during initial entry training, at Fort Benning. I also expect to find that the injury presentation levels will be significantly different based on types of training conducted. This information will allow for changes that should reduce the volume of patients

presenting to sick call, positively impact staffing at the clinics and reduce the return to training time for the trainees.

Throughout this study I will be conferring with medical providers and commanders in order to foster support for future change. I will present my findings to the unit commanders and Drill Instructors so that they may become aware of what can increase a trainee's risk for injury. I will also present information on what types of training may increase the risk of injury, based on the date soldiers present to one of the healthcare facilities with an injury.

These reduced injury rates will secondarily reduce the stress presently experienced by the already short-staffed clinics. A method will also be established for the medical community to provide continuing feedback to the training community on their injury rates. All of these data will also be available for CHPPM.

My timeline for this research was as follows: 1 October 2000 through 15 November 2000 conducted the initial injury surveillance. 15 November 2000 through 1 December 2000 convened a group of medical providers to discuss initial findings. 1 December 2000 through 1 January 2001 presented initial data to Martin Army Community Hospital and training commanders. 1 January 2001 through April 2001 conducted my 9 – 14 week full training cycle injury surveillance. April 2001 concluded my research and presented data and recommendations to all involved.

Initial Surveillance

Background

At Fort Benning, during the initial surveillance period (1 October 2000 to 15 November 2000) individual training brigades reported a census of 7,876 trainees. The Basic Combat Training Brigade (BCTB) reported a census of 2,727 trainees during this time. The Infantry Training Brigade (ITB) reported a census of 5,149 trainees during this time frame. After exporting the unit specific data some trainee demographic information was corrupted or left blank these records were removed from the study. After removing the aforementioned records, 7,721 trainees were observed for injury presentations. Since this study is interested in risk factors for injury only those visits that were coded as initial injury presentations were collected. Information on 747 injuries to basic trainees was collected. This information was collected from CHCS patient appointment files linked to the ADS diagnoses designated by the providers.

Qualitative Analysis

Initially qualitative analyses were conducted on the 747 injuries. To determine the types of injuries that basic trainees were presenting for injury data were imported into Microsoft Access and queried for injury diagnoses (see Appendix 1). The results were screened and grouped for similar injuries. These groups were then ranked in order of frequency of presentation. As seen in table 1 on page 18, the top four injuries sustained by trainees are strains, sprain, and fractures to the upper and lower extremities.

In order to determine where the majority of these injuries were occurring the injury data were queried for unit identification (see Appendix 2). Those data with missing or indiscernible unit information were filtered out during this analysis. The remaining 651 entries were grouped by parent unit (BCTB/ITB). As seen in table 2, page 27, the data were compared to the self-reported census numbers in order to determine injury presentation rates per unit and a comparable relative rate.

Table 1

Injury Diagnoses Grouped by Presentation Frequency.

Injury	Count
Lower Extremity Sprains	444
Lower Extremity Fractures	90
Upper Extremity Sprains	49
Upper Extremity Fractures	24
All Other Injuries Combined	140

Based on the information presented in table 2 it appears that trainees in the Infantry Training Brigade are almost four times as likely of being injured than trainees in the Basic Combat Training Brigade, even when population differences are accounted for. Why this is occurring will be left for another study. Due to the increased likelihood of injury in the ITB, trainees from this brigade will be used to identify the risk factors for injury in the final study.

Table 2

Unit Specific Injury Presentation Data Based on Self-Reported Unit Census (1 October 2000 to 15 November 2000).

	BCTB	ITB
Injuries	81	570
Self-Reported Census	2,727	5,149
Percent Injured (%)	2.97	11.07
Relative Rate	1	3.73

Quantitative Analysis

The initial surveillance does not follow any unit through a complete training cycle and will be used more to focus the final study where it can provide the most benefit. Therefore, the quantitative analysis will be performed on a sample set of the original 7,721 trainees. The original list of trainees was imported into SPSS, a statistical analysis software package. SPSS was used to select a random sample of trainees. The sample set consisted of 73 trainees (see Appendix 3).

A ten step quantitative analytic process was used for the examination of the statistical significance of age and ethnicity as a function of injuries in basic trainees. These steps generally follow the statistical procedures described by Donald H. Sanders (1995). The process is used to **observe, describe, explain, predict, test, evaluate** and **control** hypotheses associated with the relationship between two risk factors (age & ethnicity) and injuries in basic trainees. The process of

control will be left to the unit commanders, drill instructors, and healthcare providers.

Ten Steps for Hypothesis Testing – Functional Form Statistics

Step 1. Define persons, object or events used. The data set consists of n=73 initial entry trainees at Fort Benning, Georgia.

Step 2. Determine measures taken and units (operation definitions and data coding). The dependent variable (Y) was injury, coded "1" if the trainee was injured during the original surveillance period, "0" otherwise. Injury is a dichotomous variable. The independent variables (X) are age and ethnicity/race. Age is a continuous variable. Ethnicity/race were individually coded "1" for a specific race and "0" otherwise. Race is a dichotomous variable.

Step 3. Delineate the hypothesized functional relationship and specify the context. Injuries in initial entry trainees at Fort Benning, Georgia are a function of age and ethnicity/race. If the relationship holds, education and closer observation of trainees within these risk groups will reduce the injury presentation rate.

Step 4. State the formal alternate and null hypotheses in terms of difference model versus a no difference model.

H_a: Differences in injury are related to differences in age and race.

H_0: Differences in injury are not influenced by age or race.

Step 5. Tentatively select alpha, the critical probability

level, as a baseline decision rule. Alpha probabilities were set at the $p = .05$ level for the data set analysis.

Step 6. Compute descriptive statistics summary (1- & 2-way frequency distributions, means, standard deviations, and correlations.) Graph the results in Functional Form. Note the direction and magnitude of X and Y. Data files were constructed for the data set; means and standard deviations were also computed (see Appendices 4-5). Appendix 6 contains the one-way frequency distributions. Appendix 7 contains the computations for correlations. The regression equation was also computed for the data set (see Appendix 8). In Appendix 9 the two-way distribution for age indicates a negative relationship for age as a function of injury. The two-way distributions for race show: a negative relationship for the Asian and Black race as a function of injury and a positive relationship for Caucasians and Other races as a function of injury.

Step 7. Select and calculate the appropriate inferential statistical test, proper degrees of freedom (df), and the probability of the test result. The discriminant function test was used to determine the statistical significance of age. The Chi Squared test was used to determine the statistical significance of race (see Appendix 8). These statistical tests are also the tests of the probability of there being no difference; the regression slope being zero.

Step 8. Evaluate the computed test result for statistical significance. Exact probabilities are computed in appendices 7 and 8. For the n = 73 data set, age had an $F = .1742$, critical

values for F with df = (1,71) are not listed. The critical values for df = (1,70) and df = (1,80) at the alpha = .05 level will be used for comparison. The critical value for df = (1,70) is 3.98. The critical value for df = (1,80) is 3.96. When the F value is compared to the critical values we have to accept the null hypothesis. For the n = 73 data set, asian had a χ^2 = .332, black had a χ^2 = 1.089, caucas had a χ^2 = .111, and other had a χ^2 = .613. The critical value for 1 df is 3.841 (alpha at .05 level). When the χ^2 value is compared to the critical values we have to accept the null hypothesis (critical values from Edwards, 1984, Table II, pg. 192 and Table VI, pg. 198).

Step 9. Write a narrative for both descriptive and inferential results. Interpret the results; note the direction and magnitude of the test, and the effects of the X upon the Y. Generalize the results and implications of the findings to the stated context. This step appears below in the results and conclusions section.

Step 10. Write the result in standard form for statistical results. For age: For the data set n=73, $F(1,71) = 1.742$, $p > .05$
For race (Asian): For the data set n=73, $\chi^2(1) = .332$, $p > .05$
For race (Black): For the data set n=73, $\chi^2(1) = 1.089$, $p > .05$
For race (Caucas): For the data set n=73, $\chi^2(1) = .111$, $p > .05$
For race (Other): For the data set n=73, $\chi^2(1) = .613$, $p > .05$

Results

Descriptive Statistics

Results for age are displayed in Table 3 below. Since these are military initial entry trainees the disparity in age is

limited. The majority of these trainees are at the bottom of the age scale as can be seen in the one-way frequency distribution computed for the data set (see Appendix 6). It can also be seen in Appendix 6 that Caucasians make up over half of the sample set's population. Pearson correlation coefficient results are seen in Table 3. Age has a negative number indicating that as a trainee's age increases there is less propensity for injury. Correlations were interpreted and displayed in Venn diagrams. Figure 1, pg 32 depicts age, Appendix 10 depicts the individual race diagrams. The variance of age accounts for just over 2% of the injuries.

Table 3

Descriptive Statistics for Injury as a Function of Age and Race

Sample Size	Variable	Average	S.D.	Correlation
73 Trainees				
	age	19.67	2.03	-.155
	asian	.0411	.1999	-.0674
	black	.1233	.3310	-.1221
	caucas	.6575	.4778	.0390
	other	.1781	.3852	.0916

The variances for the individual races: asian, black, caucasian, and other account for only .45%, 1.49%, .15%, and .84% of injuries respectively.

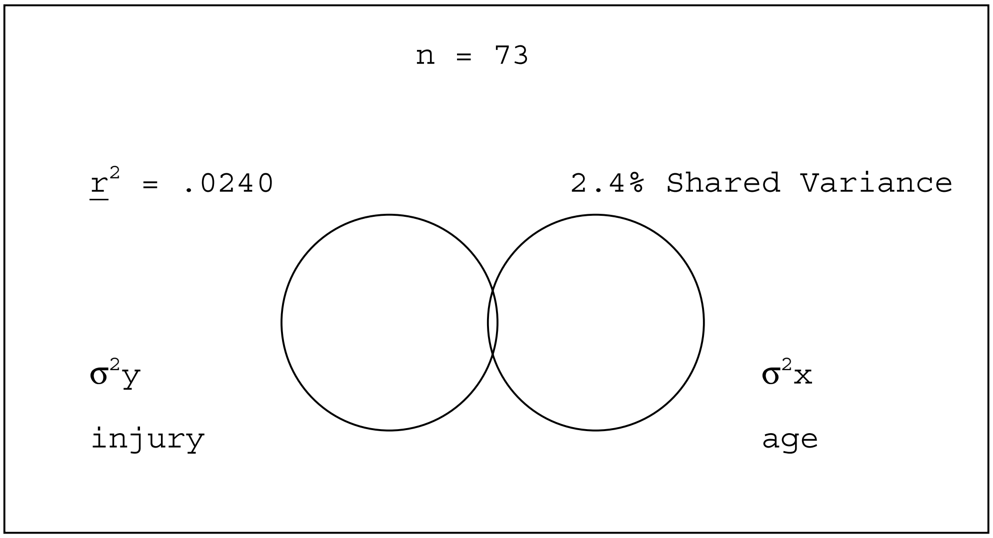


Figure 1. Percent of variance in injuries is accounted for by the variance of age

Graphic Representation of the Prediction Equation

The regression results are displayed in Table 4 on page 33. The slope for all regression lines is such that there is little change in injury presentation as trainees present in any of the risk categories, for this sample set. The graphs of the regression lines are displayed in Appendix 9. The slopes of all regression lines show weak relationships between injuries and age or race, for this sample set.

Inferential Statistics

The results presented in Table 4 show that for n = 73 there is no significant trend. Under no circumstances did the data set exceed the alpha level of $p = .05$. As such, we have to accept the null hypothesis; there is no difference in injury presentation rates.

Table 4

Regression Results and Inferential Hypothesis Tests of Injury and Risk Factor (Age & Race) Correlations

Sample size	Regression Equation* Y′ = a + b x	r	Probability estimate	df	exact p
73 Trainees					
Age:	Y′ = .541 - .0226 x	.155	1.742	71	.191
Asian:	Y′ = .1000 - .1000 x	-.0674	.332	1	.565
Black:	Y′ = .1094 - .1094 x	-.1221	1.089	1	.297
Caucas:	Y′ = .0800 + .0242 x	.0390	.111	1	.739
Other:	Y′ = .0833 + .0705 x	.0916	.613	1	.434

*a is the Y intercept and b is the slope of the regression line.

Discussion

The findings from this sample study indicate that there is no relationship between the injury presentation rates and either of the risk factors identified, age or race. Although this is not what was expected it is not unrealistic. This initial surveillance looked at trainees based on a snapshot in time. The surveillance was based on a six-week view of injuries; it did not take into account any training cycles. Many of these units may have been just starting up and had not started any physical activity, or may have been at the graduation point where training had slowed as well as the injury rates. As well, those that may have had significant injuries may have been separated

from the military and therefore would not show up in this surveillance.

In the final study I followed trainees, identified in the initial surveillance, through one complete training cycle. Therefore, all injuries that these trainees present for will be observed; any trainees that are separated due to significant injury will be observed and annotated prior to separation. Based on my initial surveillance and the resultant likelihood of injury between the Basic Combat Training Brigade (BCTB) and the Infantry Training Brigade (ITB) my final study followed units from the ITB through a complete training cycle.

I still expect to find significant differences in injury presentation rates based on the different risk factors. During the initial surveillance I only looked at two different types of risk factors. For the final study I will look at these risk factors, but after conversations with medical and unit personnel I will expand the number of risk factors. I will look at seven risk factors: age, weight, total fitness, aerobic fitness, race, previous injury, and training. Weight will be measured by overweight status as determined by Army Regulation 600-9. A copy of the Army's standards for overweight status is shown in Appendix 11. A trainee's overweight status will be determined based on their initial entry medical assessment. Total fitness and aerobic fitness will be assessed using the Army's physical fitness test scores; using a trainee's total score for total fitness and their 2-mile run score to assess their respective aerobic fitness. Previous injury will be based on self-reported

injuries as found on their initial medical assessment. Only those entries that can be attributed to a specific injury will be used; any entry that cannot be specifically linked to an injury will be left out.

Final Study

Background

At Fort Benning, the final study was conducted on two units in the Infantry Training Brigade (ITB). The 13-week training cycle for these units was from 15 January 2001 to 13 April 2001. The manning rosters for these two units reported a combined census of 442 trainees. During the initial days of assignment the trainees went through an inprocessing procedure where their medical records were collected and initial physical fitness (PT) tests were administered; PT tests consisted of push-ups, sit-ups, and a 2-mile run. Due to the scope of this study any trainee who did not take a PT test was removed from the study. As well, anyone who did not participate in one or more PT test events was removed from the study. Lastly, anyone who did not have a medical record available for screening was removed. Six trainees did not take a PT test, four did not participate in the 2-mile run, and 123 had missing medical records. The missing medical records were attributed to already initiated separation physicals, airborne physicals that were never returned, and otherwise “lost” records. The final number of trainees surveyed in this study was 309. As with the initial surveillance all trainee specific information (name and SSN) will be removed and individual roster numbers will be used to identify trainees.

Again, since this study was only interested in risk factors for injury only those visits that were coded as initial injury presentations were collected. During the 13-week training cycles information on 41 injuries was collected, for this specific population.

Qualitative Analysis

Initial qualitative analyses were conducted on the 41 injuries. To determine the types of injuries that this population presented for injury data were imported to Microsoft Access and queried for diagnoses (see Appendix 12). The results were screened and grouped for similar injuries. These groups were then ranked in order of frequency of presentation. As seen in table 5, 98% of the injuries were to the lower extremities.

Table 5

Injury Diagnoses Grouped by Presentation Frequency.

Injury	Count
Lower Extremity Strains & Sprains	33
Lower Extremity Fractures	4
Other Lower Extremity Injuries	3
All Other Injuries	1

In order to determine when the majority of these injuries were occurring the data were arranged in a Pareto-style graph. As can be seen in figure 2 the data indicates that over 50% of all injuries incurred, occurred in the first five weeks of

training. Weeks 2 and 3 represent 1/3 of all injuries incurred.

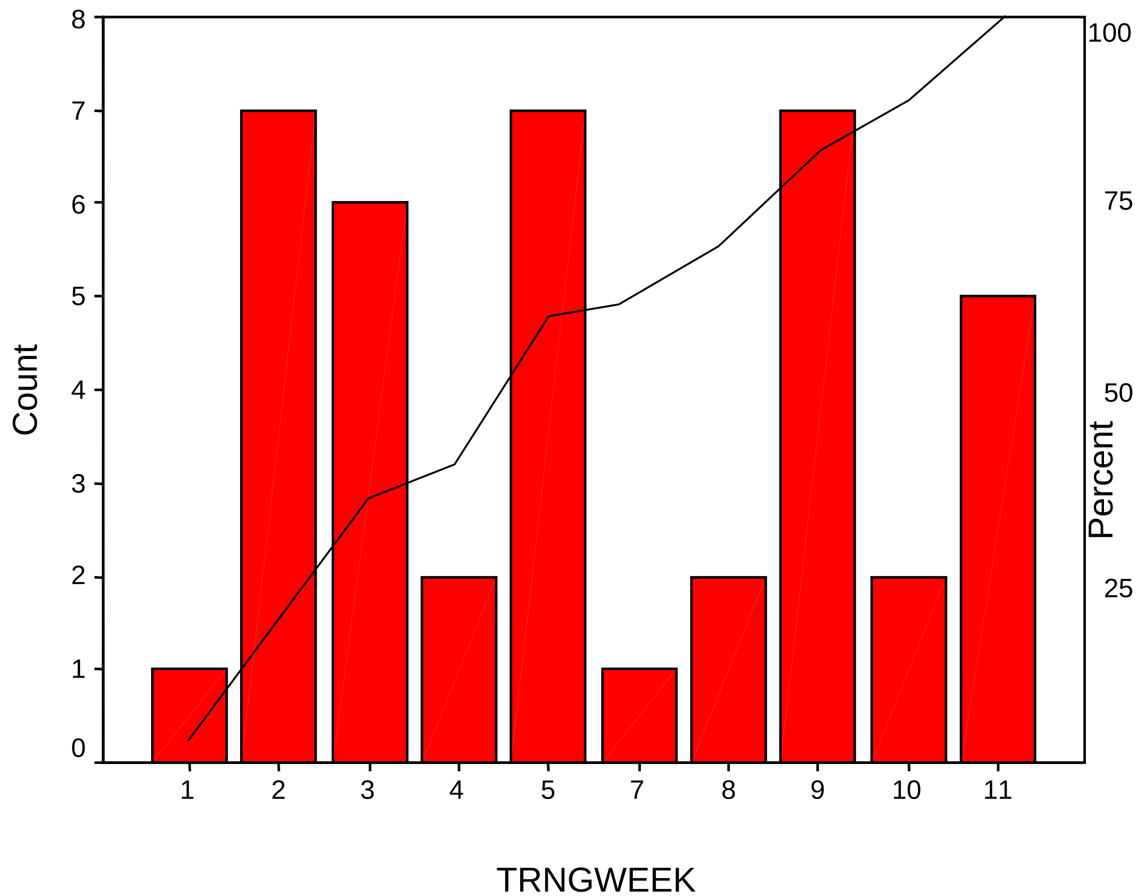


Figure 2. Cumulative percentage of injury presentations by training week

Quantitative Analysis

For this study I will use the entire sample set of 309 trainees for the quantitative analysis (see appendix 13). The quantitative analytical process will be the same as was used for during the initial surveillance. The analytic process will determine the statistical significance of age, ethnicity, weight, fitness, and a trainee's history of previous injury as a function of injuries in basic training. The process will be used

to **observe, describe, explain, predict, test, evaluate** and **control** hypotheses associated with the relationship between multiple risk factors and injuries in basic trainees. The process of **control** will again be left to the unit commanders, drill instructors, and healthcare providers.

Ten Steps for Hypothesis Testing – Functional Form Statistics

Step 1. Define persons, object or events used. The data set consists of n=309 initial entry trainees at Fort Benning, Georgia.

Step 2. Determine measures taken and units (operation definitions and data coding). The dependent variable (Y) was injury, coded "1" if the trainee was injured during the 13-week training cycle, "0" otherwise. Injury is a dichotomous variable. The independent variables (X) are age, ethnicity/race, weight, total fitness (as determined by individual PT tests), individual fitness (as determined by individual events in the PT tests), and previous history of injury. Age, individual fitness, and total fitness are continuous variables. Ethnicity/race were individually coded "1" for a specific race and "0" otherwise. Weight was coded "1" for overweight, as determined by Army regulations, during the initial entrance physical and "0" otherwise. History of previous injury was coded "1" for self-reported history of injury during initial entrance physical and "0" otherwise. Ethnicity/race, weight, and previous history are all dichotomous variables.

Step 3. Delineate the hypothesized functional relationship and specify the context. Injuries in initial entry trainees at

Fort Benning, Georgia are a function of age, ethnicity/race, weight, individual and total fitness levels, and previous injury history. If the relationship holds, education and closer observation within these risk groups will reduce injury presentations. Physical fitness requirements prior to start of training would also reduce injury.

Step 4. State the formal alternate and null hypotheses in terms of difference model versus a no difference model.

H_a: Differences in injury are related to differences in age, race, weight, individual and total fitness levels, and previous injury.

H_0: Differences in injury are not influenced by the aforementioned risk factors.

Step 5. Tentatively select alpha, the critical probability level, as a baseline decision rule. Alpha probabilities were set at the $p = .05$ level for the data set analysis.

Step 6. Compute descriptive statistics summary (1- & 2-way frequency distributions, means, standard deviations, and correlations.) Graph the results in Functional Form. Note the direction and magnitude of X and Y. Data files were constructed for the data set; means and standard deviations were also computed (See Appendices 14-15). Appendix 16 contains the one-way frequency distributions. Appendix 17 contains the computations for correlations. The regression equation was also computed for the data set (see Appendix 18). Figure 3, below, indicates a positive relationship for the Hispanic race as a function of injury. In Appendix 19 the two-way distribution for

age shows a positive relationship for age as a function of injury. The two-way distributions for previous injury history, push-up score, run score, cumulative PT score, overweight at initial physical, and all other races depict negative relationships between these risk factors as a function of injury.

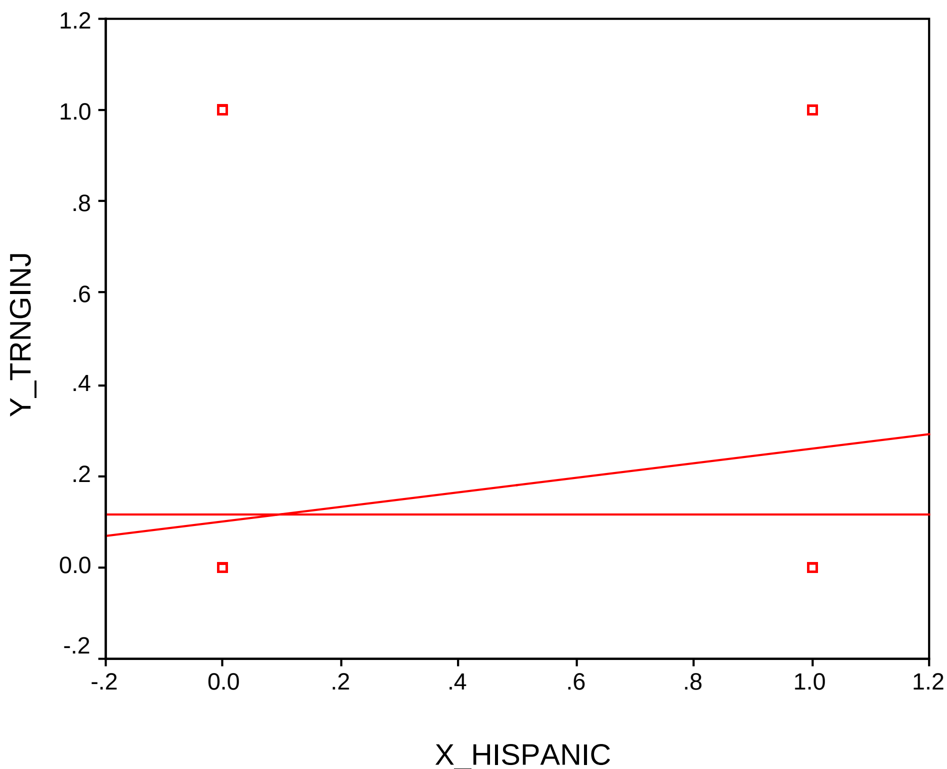


Figure 3. Graphic representation of the least-squares regression prediction of training injuries based upon Hispanic race data.

Step 7. Select and calculate the appropriate inferential statistical test, proper degrees of freedom (df), and the probability of the test result. The discriminant function test was used to determine the statistical significance of age, push-

up score, run score, and total physical fitness score. The Chi Squared test was used to determine the statistical significance of previous history of injury, overweight at initial physical, and race (see Appendix 18). These statistical tests are also the tests of the probability of there being no difference; the regression slope being zero.

Step 8. Evaluate the computed test result for statistical significance. Exact probabilities are computed in appendices 17 and 18. For the n = 309 data set, age had an $F = .064$, push-up score had an $F = .480$, run score had an $F = 1.006$, and cumulative PT score had an $F = 1.233$. Critical values for F with df = (1,307) are not listed, therefore critical values for df = (1,200) and df = (1,400) at the alpha = .05 level will be used for comparison. The critical value for df = (1,200) is 3.89. The critical value for df = (1,400) is 3.86. When the F for each of these risk factor values are compared to the critical values we have to accept the null hypotheses. For the n = 309 data set, previous injury history had a $\chi^2 = .256$, overweight at initial physical had a $\chi^2 = 1.685$, Asian had a $\chi^2 = 1.595$, Black had a $\chi^2 = .171$, Caucasian had a $\chi^2 = .032$, Hispanic had a $\chi^2 = 5.390$, and other races combined had a $\chi^2 = 1.184$. The critical value for 1 df is 3.841 (alpha at .05 level). When the χ^2 value for Hispanic race is compared to the critical value the null hypothesis for was rejected and the alternate hypothesis was accepted. When the χ^2 values for the other risk factors were compared to the critical value we had to again accept the null hypotheses (critical values from Edwards, 1984, Table II, pg. 192 and Table

VI, pg. 198).

Step 9. Write a narrative for both descriptive and inferential results. Interpret the results; note the direction and magnitude of the test, and the effects of the X upon the Y. Generalize the results and implications of the findings to the stated context. This step appears below in the results and conclusions section.

Step 10. Write the result in standard form for statistical results. For age: For the data set n=309, $F(1,307)=.064$, $p > .05$

For injury history: for the data set n=309, $\chi^2(1) = .256$, $p > .05$

For push-ups: For the data set n = 309, $F(1,307) = .480$, $p > .05$

For PT run: For the data set n = 309, $F(1,307) = 1.006$, $p > .05$

For PT score: For the data set n = 309, $F(1,307) = 1.233$, $p > .05$

For overweight: for the data set n = 309, $\chi^2(1) = 1.685$, $p > .05$

For race (Asian): For the data set n = 309, $\chi^2(1) = 1.595$, $p > .05$

For race (Black): For the data set n = 309, $\chi^2(1) = .171$, $p > .05$

For race (Caucas): For the data set n = 309, $\chi^2(1) = .032$, $p > .05$

For race (Hisp): For the data set n = 309, $\chi^2(1) = 5.390$, $p < .05$

For race (Other): For the data set n = 309, $\chi^2(1) = 1.184$, $p > .05$

Results

Descriptive Statistics

Results for various risk factors are displayed in table 6 below. As with the initial surveillance the majority of trainees are at the bottom of the age scale, as seen in the one-way frequency distribution in Appendix 16, with little disparity between the ages. When we look at the trainees' PT scores we see that only about 3%, of the sample set's population, passed the

Army Physical Fitness Test (APFT) (see Appendix 16). Again, as can be seen in the one-way frequency distributions only about 20% of the trainees had a history of previous injury or were overweight at their initial physical. When we look at race we see that nearly 80% of the trainees are Caucasians with the remaining races (Asian, Black, Hispanic, and Others) each accounting for about 5% of the sample set's population.

Table 6

Descriptive Statistics for Injury as a Function of Various Risk Factors

Sample Size	Variable	Average	S.D.	Correlation
309 Trainees				
	age	20.64	3.32	.0144
	inj hx	.2039	.4035	-.0287
	PU score	42.06	17.33	-.0395
	run score	28.40	25.44	-.0571
	cum score	106.61	49.19	-.0632
	overwght	.2298	.4214	-.0738
	asian	.0388	.1935	-.0718
	black	.0744	.2629	-.0235
	caucas	.7832	.4128	-.0102
	hispan	.0744	.2629	.1321
	other	.0291	.1684	-.0619

Pearson correlation coefficient results are seen in table 6. Age has a positive number indicating that as a trainee's age increases so does the likelihood that he will be injured. Previous injury history and overweight status at initial physical have negative numbers indicating that a trainee with a

history of previous injury or overweight status at initial physical has less propensity for injury. All PT score results have negative numbers indicating that as PT scores increase the likelihood for injury decreases. With regards to race, the results for Hispanic race have a positive number indicating that being Hispanic increases a trainee's likelihood for injury. Correlations were interpreted and displayed in Venn diagrams. Figure 4 below depicts Hispanic race, Appendix 20 depicts all other individual risk factors.

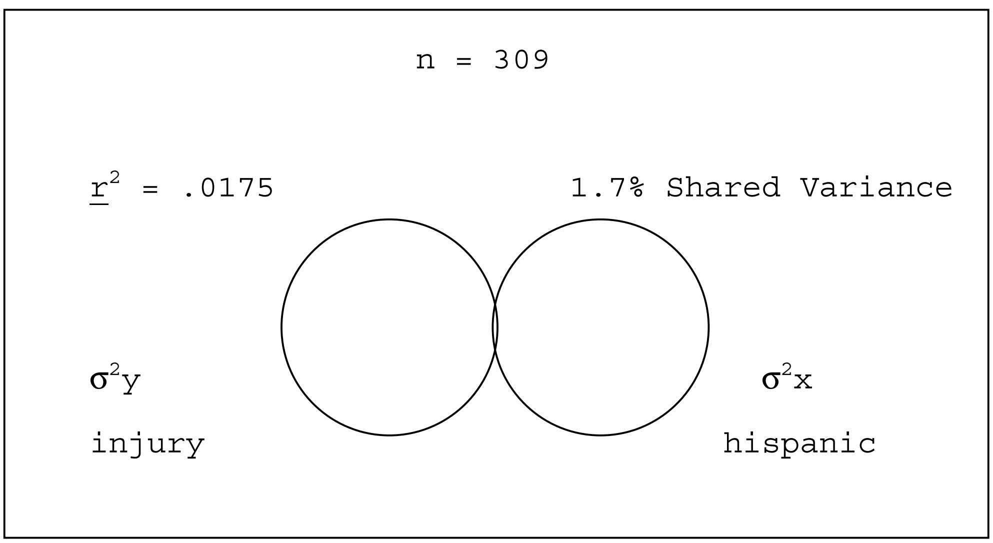


Figure 4. Percent of variance in injuries is accounted for by the variance of race (Hispanic)

The variance of Hispanic race accounts for almost 2% of the injuries. The variance for age accounts for only .02% of the injuries. The variances associated with a history of previous injury and overweight status only account for .08% and .54% of injuries respectively. PT scores, as well, only account for .16%

(push-ups), .33% (run), and .40% (cumulative) of the injuries. The variances for all other races: Asian, Black, Caucasian, and Other account for only .52%, .06%, .01%, and .38% of injuries respectively.

Graphic Representation of the Prediction Equation

The regression results are displayed in table 4. The slopes for all regression lines, save Hispanic race, are such that there is little change in injury presentation as trainees present in any of the risk categories. The slope for Hispanic race indicates that there is an increase in injury presentation based on a trainee being of the Hispanic race. The graph of the regression line for Hispanic race is displayed in Figure 3, pg 40. All other graphs of the regression lines are displayed in Appendix 19. These regression lines indicate a weak relationship between any of risk factors and injury presentation for this sample set.

Inferential Statistics

The results presented in table 7, page 46, show that for n = 309 there no significant trend. The only circumstance in the data set that exceeded the alpha level of $p = .05$ was for the Hispanic race. As such we can reject the null hypothesis for Hispanic race and accept the alternate hypothesis. For all other risk categories we have to accept the null hypothesis; there is no difference in injury presentation rates.

Table 7

Regression Results and Inferential Hypothesis Tests of Injury and Risk Factor Correlations

Sample size	Regression Equation* Y' = a + b x	r	Probability estimate	df	exact p
309 Trainees					
Age:	Y' = .0848 + .0014 x	.0144	.064	307	.800
Hx:	Y' = .1179 - .0226 x	-.0287	.256	1	.613
PU:	Y' = .1437 - .0007 x	-.0395	.480	307	.489
Run:	Y' = .1335 - .0007 x	-.0571	1.006	307	.317
Score:	Y' = .1568 - .0004 x	-.0632	1.233	307	.268
Weight:	Y' = .1261 - .0556 x	-.0738	1.685	1	.194
Asian:	Y' = .1179 - .1178 x	-.0718	1.595	1	.207
Black:	Y' = .1154 - .0284 x	-.0235	.171	1	.679
Caucas:	Y' = .1194 - .0078 x	-.0102	.032	1	.858
Hispan:	Y' = .1014 + .1595 x	.1321	5.390	1	.020
Other:	Y' = .1167 - .1167 x	-.0619	1.184	1	.277

*a is the Y intercept and b is the slope of the regression line.

Discussion

The findings from this study show that there is virtually no relationship between any of the identified risk factors and injury presentation for basic trainees at Fort Benning, Georgia. In the initial surveillance the lack of any relationship was surprising, but due to the time frame of the surveillance was not unrealistic. This study was conducted on two complete units for their entire 13-week training cycle and therefore it was more surprising that there was virtually no relationship found. Another surprising find was that injuries occurred in only about

11% of recruits; there were 35 injury presentations in the n = 309 sample set. Based on research conducted by Kaufman, et al. (2000) this equates to only about 2 trainees per 100 presenting for an injury per month, well below their 6 – 12 per 100 trainees per month. Popovich, et al. (2000) found that musculoskeletal injuries were very common in basic training environments. They also found that injury presentations occurred in 15 – 31% of male recruits, these injuries were predominantly in the lower extremities. Another study done by Gardner, Dziados, Jones, Brundage, Harris, Sullivan, and Gill (1988) found that 1 – 4% of male trainee populations suffer stress fractures during basic training. Only four fractures were captured in the final study (.01%). The low number of injury presentations found at Fort Benning, during the final study deserves more attention. Nearly all published studies researching a relationship between different risk factors and injuries were conducted on thousands of trainees at a time. This study only followed 309 trainees and may be the cause for lower presentation rates. This may also have led to the limited relationship between the risk factors and injury presentation. The types of injury presentations found in the final study (Table 5, pg 36) were predominantly to the lower extremities; similar to the findings of Popovich et al.. They also follow Kaufman et al. who found that pain, strains, sprains, knee injuries and fractures as the top five injury presentations for Army infantry basic trainees.

When we look at the time distribution of injury

presentations it is difficult to determine the exact date of injury. Garcia, et al. (1987) found that on average soldiers presented for injury 5.3 ± 8.5 days after the onset of pain. And in research into risk factors for injury conducted by Henderson, et al. (2000) the date of presentation was used to establish the week of injury and subsequently graph incidence rates. This method of establishing the week of injury was used in this study. Piatanida, et al. (2000) found that injury rates are highest when a trainee's initial fitness is low and their training frequency and duration increases. This is indicative of the first few weeks of basic training. As well, Henderson et al. found that the injury rates for soldiers progressively increased during the first three weeks of training, peaking in the third week and then declining. For this study presentation rates appeared to follow previous research results with an increase during the second and third weeks of training, approximately one-third of all injuries presented during these two weeks (see Figure 2, pg 37). Popovich et al. (2000) found during their research that high marching companies produced higher injury rates than did comparable companies with lower days and/or distance of marching. Though injury presentations for the n = 309 data set did peak again in weeks five and nine this is thought to be the result of the increased mileage of foot marches in combination with assault courses during these same weeks. In terms of fractures Popovich et al. also found that the highest presentation rates would be found in the first three weeks of training. During this study only one of the four

fractures presented during this time frame with the remainder presenting during the ninth week. The increase in fracture presentations during week nine is suspected to be due to the increased physical activity previously mentioned.

As we look at the individual risk factors finding no statistically significant relationship between age and injury presentation in our sample set is not unrealistic. Tomlinson, Lednar, and Jackson (1987) found that older soldiers ($\geq$ 26 years of age) were more likely to sustain more severe injuries or take longer to heal than younger soldiers ($\leq$ 25 years of age) $p < .05$. After the final study it was found that the age categories for initial entry trainees, at Fort Benning, are such that over 95% fell into the 17 - 26 year old age group. This puts basic trainees at Fort Benning in the lower category of the Tomlinson et al. study where no significant injury differences were found. Though significant differences were found when comparing injury presentation rates of soldiers > 24 years of age with soldiers < 19 years of age; there was significant increase in risk with increased age, $p = .01$ (Jones, Cowan, Tomlinson, Robinson, Polly, and Frykman, 1993). The resulting regression equation slope of .0014 for the $n = 309$ sample set, makes apparent that the limited disparity in age does not produce any significant relationship with injury presentation. The fact that the regression slope is positive for the final study and negative for the initial study may warrant additional research. Reynolds, et al. (1999) found that younger age was a significant risk factor for injury ($p = .02$) indicating that individually the

conflicting regression slopes are not unusual, but since they show up in the same training environment it may, again, warrant further study.

Schneider, et al. (2000) found that there was a seven-fold increase in injuries for soldiers who had a previous history of injury when compared to those soldiers without any history of injury. During the final study 22% of the sample set reported any previous history of injury and accounted for only .08% shared variance with injury presentations. Though no significance was found the slope of the regression equation for this risk category was -.0226, initially indicating that for this sample set, trainees with a previous history of injury seemed less prone to injury than other trainees. This result may warrant more research into the relationship between previous injury history and injury presentation.

Piatanida et al.(2000) found that physical fitness is a critical element in the occurrence of injury in military related training. Little research has been conducted that identifies any relationship between push-ups and injury. Jones, Bovee, Harris, and Cowan (1993) found during their research that push-ups did produce a significant relationship for injury. In my research no relationship was identified for this risk category, with only .16% shared variance between the two and $\underline{p} > .05$. The slope of the regression equation (-.0007) is so slight that almost no difference exists between this and the null hypothesis. This also indicates that future studies should not look to a trainee's ability to perform push-ups as an indicator for injury

presentation. Piatanida et al. also found that cardiorespiratory/aerobic fitness was a significant risk factor for injury with the lower levels of fitness having the greatest risk. Jones et al. determined that a soldier's run time was a valid determinant for aerobic fitness. Using individual PT run scores for the trainees I found no significant relationship with injury presentation. Even though no significance was found there was twice the shared variance with between trainee's run scores and injury presentation, than there was with the push-up scores (.33% vice .16%). This would indicate that run scores are a better determinant for injury risk than push-ups. The regression equation for run scores is similar to the push-up score. The negative slopes though, indicate that the better the score the less likely a trainee is of presenting with an injury. Lastly the cumulative PT score was used to identify a potential relationship with injury presentation. Similar results were found in the n = 309 data set. Though there was a slight increase in the shared variance between a trainee's cumulative PT score and injury presentation this was simply due to the effect of adding the scores. Since the slope of the cumulative score regression equation is almost half the slope for run scores (-.0004 vice -.0007) future studies should focus more on a trainee's aerobic fitness level when trying to determine injury presentation relationships.

High body fat was found to be a significant risk factor for injury (Jones et al., 1993). Ross and Woodward (1994) found that recruits with a body fat percentage > 26.9 were seven times more

likely to be injured than those with a body fat percentage < 20.0. During the initial entrance physical for the trainees in my research data set, over 20% (71) of the trainees were determined to be overweight and greater than 22% body fat, by Army Regulation 600-9. During the 13-week training cycle less than 10% (5) of these trainees presented with injury. Though no significant relationship was found, outside of Hispanic race a trainee's initial overweight status had the highest shared variance with injury presentation (.54%) and was closer to having a significant relationship with injury presentation than any other risk category ($\chi^2(1) = 1.685$, $\underline{p} = .194$). What was more interesting was that the regression equation indicates a negative relationship (Y' = .1261 - .0556x). This means that a trainee who initially presented as overweight/over-fat was less likely to be injured during basic training than those who were not overweight/over-fat. This lower incidence of injury presentation may be due to an increase in physical activity prior to entering active service; an individual must meet minimum body fat standards as determined in Army Regulation 600-9 prior to entry into active service. Overweight trainees may have increased their physical activity prior to entering active service in order to meet the standards. Gardner, et al. (1988) found that recruits who were physically active prior to basic training were ten times less likely to present with an injury than inactive recruits. Jones and Knapik (1999) confirmed this with their research, finding that recruits who ran more frequently prior to entry experienced fewer injuries during

basic training.

With regards to race research indicates that Caucasians had the greatest risk for injury (Piatanida, et al., 2000). For the n = 309 data set Caucasians accounted for the least number of injury presentations (.01 shared variance). When shared variances are compared (see Figure 4, pg 45 and Appendix 20) Hispanics were highest followed by Asians, Other, Black, and lastly Caucasians. Results for this study indicating that Caucasians provided the least significant relationship with injury presentation may also warrant additional research. Though my research focused solely on injury presentations and no research was done specifically on fractures, when we look at fractures Kanpik, Reynolds, and Barson (1999) found that blacks have a higher bone density than whites, which was thought to account for lower fracture rates. And Schmidt Brudvig, Gudger, and Obermeyer (1983) found that Caucasians had the greatest risk for stress fractures. During my research there were only four fracture presentations and though the Caucasian race provided the least significant relationship with injuries, they accounted for 75% of the fractures.

The Hispanic race provided the only significant relationship for injury presentations during the 13-week training cycle. Although additional research, surveying larger number of trainees, is necessary this does provide some benefit. This research was intended to provide leaders with potential risk factors for injuries so that they could be better able to manage trainees in these categories for early signs of potential

injury. Since soldiers with minor injuries often don't seek medical care and are more often reluctant to disclose disabilities, initial signs of potential injury (pain, etc.) left untreated may lead to more serious injuries (strains, sprains, or fractures). Since this research has shown that there is a significant relationship between the Hispanic race and injury presentation the trainees that fall into this race category could be monitored more closely as they are more likely to be injured during training.

Summary

The main question this research intended to answer was what factors do we need to follow in order to reduce a unit's injury presentation rate, the only factor throughout both studies that presented any significant relationship with injuries was the Hispanic race. Continued research needs to be done to identify additional risk factors. This research did not address the impact that illnesses had on injury presentations; sick trainees may have been removed from training temporarily, reducing their exposure to factors that could increase injury presentations. Also, there is a potential for greater numbers of recruits during the summer time as opposed to springtime, due to recruits finishing school prior to entering the military. Further research should survey training cycles throughout the year in order to get a more complete picture.

Appendix 1. Excel Spreadsheet – Injury Diagnoses

Diagnosis	Number
Sprains and strains of ankle and foot	223
Sprains and strains of knee and leg	197
Fracture of one or more tarsal and metatarsal bones	69
Sprains and strains of shoulder and upper arm	34
Sprains and strains of hip and thigh	24
Contusion of lower limb and of other and unspecified sites	22
Fracture of metacarpal bone(s)	21
Dislocation of the knee	15
Other and ill-defined sprains and strains	14
Superficial injury of foot and toe(s)	13
Fracture of the ankle	11
Sprains and strains of wrist and hand	11
Contusion of upper limb	10
Other open wound of the head	9
Sprains and strains of other and unspecified parts of back	9
Superficial injury of trunk	7
Dislocation of the shoulder	6
Fracture of tibia and fibula	5
Sprains and strains of elbow and forearm	4
Superficial injury of hip, thigh, leg, and ankle	4
Contusion of trunk	3
Fracture of the facial bones	3
Fracture of the neck of femur	3
Injury, other and unspecified	3
Superficial injury of face, neck, and scalp except eye	3
Dislocation of foot	2
Fracture of other and unspecified parts of femur	2
Fracture of rib(s), sternum, larynx, and trachea	2
Fracture of the clavicle	2
Superficial injury of other, multiple, and unspecified sites	2
Burn of lower limb(s)	1
Burn of upper limb, except wrist and hand	1
Burn of wrist(s) and hand(s)	1
Certain adverse effects not elsewhere classified	1
Concussion	1
Effects of heat and light	1
Effects of reduced temperature	1
Fracture of one or more phalanges of hand	1
Fracture of the carpal bone(s)	1
Fracture of the pelvis	1
Fracture of the radius and ulna	1
Late effects of musculoskeletal and connective tissue injuries	1
Superficial injury of hand(s) except finger(s) alone	1
Traumatic amputation of other finger(s)(complete)(partial)	1

Appendix 2. Excel Spreadsheet – Unit Identification

Unit Name	Number	Unit Name	Number
30 AG BN PHY FIT DET	1	ITB 19 IN 02 BN CO C TR	2
BCTB 2D BN 47TH IN CO B TR	2	ITB 19 IN 02 BN CO D TR	14
BCTB 2D BN 47TH IN CO C TR	15	ITB 19 IN 02 BN CO E TR	1
BCTB 2D BN 47THIN CO D TR	7	ITB 30 AG BN CO A	27
BCTB 2DBN 47TH IN CO A TR	6	ITB 30 AG BN CO A	16
BCTB 38 IN 01 BN CO A	7	ITB 30 AG BN CO B	1
BCTB 38 IN 01 BN CO B	10	ITB 30 AG BN CO C PP	13
BCTB 38 IN 01 BN CO B	1	ITB 30 AG BN HHC	1
BCTB 38 IN 01 BN CO C	6	ITB 50 IN 01 BN CO A	16
BCTB 38 IN 01 BN CO D	12	ITB 50 IN 01 BN CO A	5
BCTB 38 IN 01 BN CO D	2	ITB 50 IN 01 BN CO B	28
BCTB 38 IN 01 BN CO E	3	ITB 50 IN 01 BN CO B	9
BCTB 3D BN 47TH IN CO A TR	2	ITB 50 IN 01 BN CO C	17
BCTB 3D BN 47TH IN CO C TR	4	ITB 50 IN 01 BN CO C	4
BCTB 3D BN 47TH IN CO D TR	3	ITB 50 IN 01 BN CO D	29
BCTB 3D BN 47TH INF CO B TR	1	ITB 50 IN 01 BN CO D	3
IN TNG BDE 50 IN 01 BN	6	ITB 50 IN 01 BN CO E	35
IN TNG BDE 54 IN 02 BN	2	ITB 54 IN 02 BN CO A	12
ITB 19 IN 01 BN CO A	27	ITB 54 IN 02 BN CO B	4
ITB 19 IN 01 BN CO A	10	ITB 54 IN 02 BN CO C	19
ITB 19 IN 01 BN CO B	18	ITB 54 IN 02 BN CO C	2
ITB 19 IN 01 BN CO B	3	ITB 54 IN 02 BN CO D	18
ITB 19 IN 01 BN CO C	34	ITB 54 IN 02 BN CO E	20
ITB 19 IN 01 BN CO C	2	ITB 58 IN 02 BN CO A	25
ITB 19 IN 01 BN CO D	22	ITB 58 IN 02 BN CO A	7
ITB 19 IN 01 BN CO D	1	ITB 58 IN 02 BN CO B	11
ITB 19 IN 01 BN CO E	19	ITB 58 IN 02 BN CO C	3
ITB 19 IN 01 BN CO E	1	ITB 58 IN 02 BN CO C	2
ITB 19 IN 02 BN CO A TR	9	ITB 58 IN 02 BN CO D	20
ITB 19 IN 02 BN CO B TR	17	ITB 58 IN 02 BN CO D	6

Appendix 3. Excel Spreadsheet – Trainee Roster

CODE	INJ	DOB	RACE	CODE	INJ	DOB	RACE
S1221	0	30-Mar-82	ASIAN	E5025	0	15-Jul-82	CAUCAS
B6594	0	12-Aug-81	ASIAN	L0716	0	15-Feb-82	CAUCAS
E0741	0	3-Feb-81	ASIAN	D3390	0	12-Jul-81	CAUCAS
J9486	0	31-May-82	BLACK	S3742	1	2-Jul-82	CAUCAS
R4590	0	3-Apr-80	BLACK	S6528	0	15-Apr-79	CAUCAS
M9570	0	30-Mar-79	BLACK	P1812	1	29-Dec-81	CAUCAS
L0233	0	13-May-82	BLACK	P0851	1	23-Oct-81	CAUCAS
C8087	0	26-Mar-78	BLACK	R0248	1	26-Jul-82	CAUCAS
L6995	0	5-Jan-80	BLACK	R0666	0	17-Dec-81	CAUCAS
J4765	0	30-Sep-82	BLACK	T7329	0	23-Oct-75	CAUCAS
H9167	0	24-Apr-80	BLACK	S1379	0	24-Aug-78	CAUCAS
H8023	0	23-Sep-81	BLACK	V3417	0	17-May-79	CAUCAS
H0663	0	11-Sep-82	CAUCAS	M6491	0	23-Nov-81	CAUCAS
H9568	0	21-Jun-78	CAUCAS	M7768	0	17-Feb-72	CAUCAS
H4694	0	5-Jan-77	CAUCAS	M0526	0	22-Jun-75	CAUCAS
H2593	0	2-Sep-82	CAUCAS	M0104	0	4-Sep-77	CAUCAS
G8626	0	4-Sep-79	CAUCAS	L4413	0	15-Feb-77	CAUCAS
J5838	0	28-Jul-82	CAUCAS	L3618	0	14-May-82	CAUCAS
H0136	0	22-Sep-80	CAUCAS	O4815	0	7-Nov-81	CAUCAS
H8551	0	23-Jun-77	CAUCAS	O0899	0	4-Nov-81	CAUCAS
J2669	0	19-Jul-79	CAUCAS	O0133	0	9-Nov-81	CAUCAS
K7778	0	31-May-81	CAUCAS	P1773	0	29-Apr-82	CAUCAS
C3581	0	2-Jan-80	CAUCAS	P5324	1	28-Feb-82	CAUCAS
D2814	0	27-Oct-81	CAUCAS	Q6356	0	16-Mar-82	OTHER
C8219	0	6-May-82	CAUCAS	L4950	0	18-Sep-82	OTHER
B1923	0	3-May-82	CAUCAS	Z8713	0	16-Jan-81	OTHER
B4868	0	21-Apr-81	CAUCAS	A4524	0	18-Feb-78	OTHER
C8355	0	4-Jun-81	CAUCAS	C0532	0	30-Mar-79	OTHER
C9182	0	30-Jul-80	CAUCAS	M6467	1	19-May-81	OTHER
C1058	0	31-Jul-80	CAUCAS	G4098	0	16-Aug-81	OTHER
B3756	0	23-Oct-80	CAUCAS	C1435	0	8-Apr-82	OTHER
F3068	0	18-Jun-82	CAUCAS	G9446	0	26-Mar-82	OTHER
S4642	0	10-Aug-82	CAUCAS	M9024	0	7-Mar-82	OTHER
S0070	0	7-Oct-81	CAUCAS	M8532	1	6-Oct-80	OTHER
F0439	0	6-Oct-82	CAUCAS	R5884	0	29-Aug-82	OTHER
D4336	0	19-May-81	CAUCAS	V5162	0	21-Sep-81	OTHER
D7631	0	18-Apr-82	CAUCAS				

Appendix 4. Excel Spreadsheet – Computer Data Files

Trainee	Y(Injury)	X(Age)	X*Y	X(Asian)	X*Y	X(Black)	X*Y	X(Caucasian)	X*Y	X(Other)
S1221	0	18	0	1	0	0	0	0	0	0
B6594	0	19	0	1	0	0	0	0	0	0
E0741	0	20	0	1	0	0	0	0	0	0
J9486	0	18	0	0	0	1	0	0	0	0
R4590	0	20	0	0	0	1	0	0	0	0
M9570	0	21	0	0	0	1	0	0	0	0
L0233	0	18	0	0	0	1	0	0	0	0
C8087	0	22	0	0	0	1	0	0	0	0
L6995	0	21	0	0	0	1	0	0	0	0
J4765	0	18	0	0	0	1	0	0	0	0
H9167	0	20	0	0	0	1	0	0	0	0
H8023	0	19	0	0	0	1	0	0	0	0
H0663	0	18	0	0	0	0	0	1	0	0
H9568	0	22	0	0	0	0	0	1	0	0
H4694	0	24	0	0	0	0	0	1	0	0
H2593	0	18	0	0	0	0	0	1	0	0
G8626	0	21	0	0	0	0	0	1	0	0
J5838	0	18	0	0	0	0	0	1	0	0
H0136	0	20	0	0	0	0	0	1	0	0
H8551	0	23	0	0	0	0	0	1	0	0
J2669	0	21	0	0	0	0	0	1	0	0
K7778	0	19	0	0	0	0	0	1	0	0
C3581	0	21	0	0	0	0	0	1	0	0
D2814	0	19	0	0	0	0	0	1	0	0
C8219	0	18	0	0	0	0	0	1	0	0
B1923	0	18	0	0	0	0	0	1	0	0
B4868	0	19	0	0	0	0	0	1	0	0
C8355	0	19	0	0	0	0	0	1	0	0
C9182	0	20	0	0	0	0	0	1	0	0
C1058	0	20	0	0	0	0	0	1	0	0
B3756	0	20	0	0	0	0	0	1	0	0
F3068	0	18	0	0	0	0	0	1	0	0
S4642	0	18	0	0	0	0	0	1	0	0
S0070	0	19	0	0	0	0	0	1	0	0
F0439	0	18	0	0	0	0	0	1	0	0
D4336	0	19	0	0	0	0	0	1	0	0
D7631	0	18	0	0	0	0	0	1	0	0
E5025	0	18	0	0	0	0	0	1	0	0
L0716	0	18	0	0	0	0	0	1	0	0
D3390	0	19	0	0	0	0	0	1	0	0
S3742	1	18	18	0	0	0	0	1	1	0
S6528	0	21	0	0	0	0	0	1	0	0
P1812	1	19	19	0	0	0	0	1	1	0
P0851	1	19	19	0	0	0	0	1	1	0
R0248	1	18	18	0	0	0	0	1	1	0
R0666	0	19	0	0	0	0	0	1	0	0

T7329	0	25	0	0	0	0	0	1	0	0	0
S1379	0	22	0	0	0	0	0	1	0	0	0
V3417	0	21	0	0	0	0	0	1	0	0	0
M6491	0	19	0	0	0	0	0	1	0	0	0
M7768	0	28	0	0	0	0	0	1	0	0	0
M0526	0	25	0	0	0	0	0	1	0	0	0
M0104	0	23	0	0	0	0	0	1	0	0	0
L4413	0	23	0	0	0	0	0	1	0	0	0
L3618	0	18	0	0	0	0	0	1	0	0	0
O4815	0	19	0	0	0	0	0	1	0	0	0
O0899	0	19	0	0	0	0	0	1	0	0	0
O0133	0	19	0	0	0	0	0	1	0	0	0
P1773	0	18	0	0	0	0	0	1	0	0	0
P5324	1	18	18	0	0	0	0	1	1	0	0
Q6356	0	18	0	0	0	0	0	0	0	1	0
L4950	0	18	0	0	0	0	0	0	0	1	0
Z8713	0	20	0	0	0	0	0	0	0	1	0
A4524	0	22	0	0	0	0	0	0	0	1	0
C0532	0	21	0	0	0	0	0	0	0	1	0
M6467	1	19	19	0	0	0	0	0	0	1	1
G4098	0	19	0	0	0	0	0	0	0	1	0
C1435	0	18	0	0	0	0	0	0	0	1	0
G9446	0	18	0	0	0	0	0	0	0	1	0
M9024	0	18	0	0	0	0	0	0	0	1	0
M8532	1	20	20	0	0	0	0	0	0	1	1
R5884	0	18	0	0	0	0	0	0	0	1	0
V5162	0	19	0	0	0	0	0	0	0	1	0
Sums:	7	1436	131	3	0	9	0	48	5	13	2
Mean:	0.0959	19.6712		0.0411		0.1233		0.6575		0.1781	
S.D.	0.2965	2.0280		0.1999		0.3310		0.4778		0.3852	

Appendix 5. SPSS Descriptive Statistics

```
Number of valid observations (listwise) = 73

Variable INJ   Injury Presentation

Mean      .0959          S.E. Mean      .0347
Std Dev   .2965          Variance       .0879
Minimum   0              Maximum        1
Sum       7

Valid observations = 73  Missing observations = 0
--------------------------------------------------------------
Number of valid observations (listwise) = 73

Variable AGE   Trainee Age

Mean      19.67          S.E. Mean       .24
Std Dev    2.03          Variance       4.113
Minimum   18             Maximum        28
Sum       1436

Valid observations = 73  Missing observations = 0
--------------------------------------------------------------
Number of valid observations (listwise) = 73

Variable ASIAN Race (Asian)

Mean      .0411          S.E. Mean      .0234
Std Dev   .1998          Variance       .0400
Minimum   0              Maximum        1
Sum       3

Valid observations = 73  Missing observations = 0
--------------------------------------------------------------
Number of valid observations (listwise) = 73

Variable BLACK Race (Black)

Mean      .1233          S.E. Mean      .0387
Std Dev   .3310          Variance       .1096
Minimum   0              Maximum        1
Sum       9

Valid observations = 73  Missing observations = 0
--------------------------------------------------------------
Number of valid observations (listwise) = 73

Variable CAUCAS Race (Caucasian)
```

Mean	.6575	S.E. Mean	.0559
Std Dev	.4778	Variance	.2283
Minimum	0	Maximum	1
Sum	48		

Valid observations = 73 Missing observations = 0

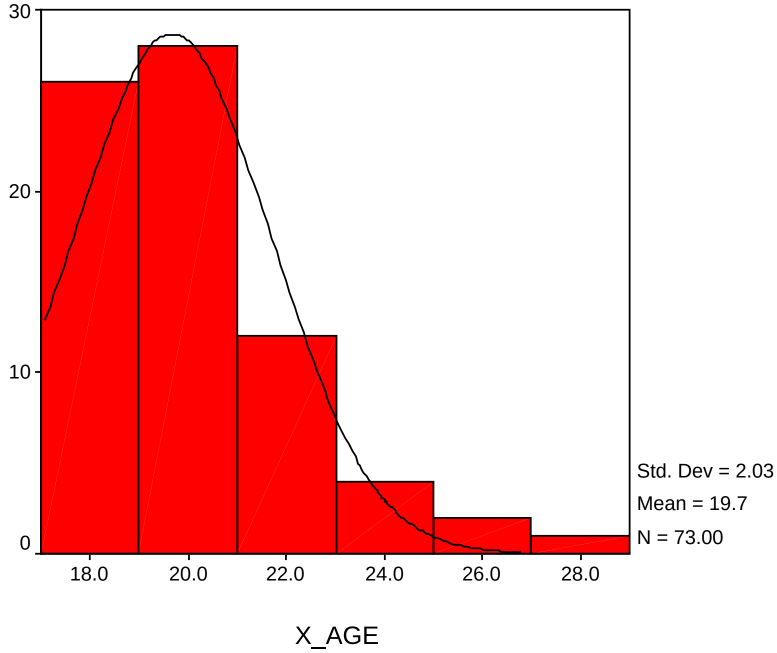
Number of valid observations (listwise) = 73

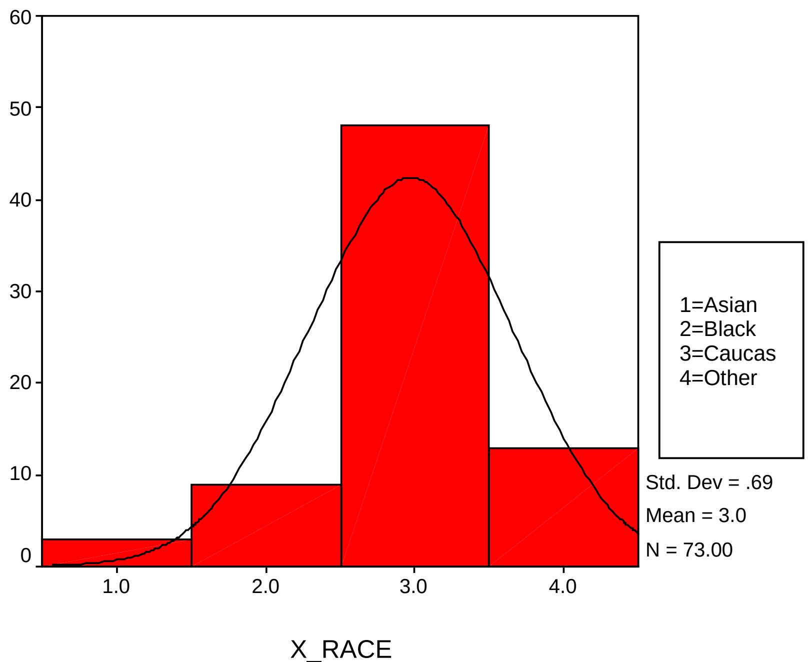
Variable OTHER Race (Other)

Mean	.1781	S.E. Mean	.0451
Std Dev	.3852	Variance	.1484
Minimum	0	Maximum	1
Sum	13		

Valid observations = 73 Missing observations = 0

Appendix 6. SPSS Frequency Distributions (Histograms)





Appendix 7. SPSS Correlation Matrix

```
Listwise Deletion of Missing Data

                Mean      Std Dev   Label

INJ              .0959      .30     Injury Presentations
AGE            19.67       2.03     Trainee Age

N of Cases = 73

Correlation, 2-tailed Sig:

                     INJ       AGE

     INJ             1.000     -.155
                                .191

     AGE             -.155     1.000
                      .191
-------------------------------------------------------------
Listwise Deletion of Missing Data

                Mean      Std Dev   Label

INJ              .0959      .30     Injury Presentations
ASIAN            .0411      .20     Race (Asian)

N of Cases = 73

Correlation, 2-tailed Sig:

                     INJ       ASIAN

     INJ             1.000     -.067
                                .571

     ASIAN           -.067     1.000
                      .571
-------------------------------------------------------------
Listwise Deletion of Missing Data

                Mean      Std Dev   Label

INJ              .0959      .30     Injury Presentations
BLACK            .12        .33     Race (Black)

N of Cases = 73

Correlation, 2-tailed Sig:
```

	INJ	BLACK
INJ	1.000	-.122 .303
BLACK	-.122 .303	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
INJ	.0959	.30	Injury Presentations
CAUCAS	.66	.48	Race (Caucasians)

N of Cases = 73

Correlation, 2-tailed Sig:

	INJ	CAUCAS
INJ	1.000	.039 .744
CAUCAS	.039 .744	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
INJ	.0959	.30	Injury Presentations
OTHER	.18	.39	Race (Other)

N of Cases = 73

Correlation, 2-tailed Sig:

	INJ	OTHER
INJ	1.000	.092 .441
OTHER	.092 .441	1.000

Appendix 8. SPSS Regression Analyses

Dependent Variable: INJ		Injury Presentations
Predictors (Constant): AGE		Trainee Age

Multiple R	.155
R Square	.024
Adjusted R Square	.010
Standard Error	.29

Analysis of Variance

	df	Sum of Squares	Mean Square
Regression	1	.152	.152
Residual	71	6.177	.0870

F = 1.742 Signif F = .191

Variables in the Equation

Variable	B	SE B	B
(Constant)	.541	.339	
AGE	-.0226	.017	-.155

Dependent Variable: INJ

Dependent Variable: INJ		Injury Presentations
Predictors (Constant): ASIAN		Race (Asian)

Multiple R	.067
R Square	.005
Adjusted R Square	-.009
Standard Error	.30

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.332	.565
Continuity Correlation	1	.000	1.000
Likelihood Ratio	1	.618	.432

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.1000	.036	
ASIAN	-.1000	.176	-.067

Dependent Variable: INJ

Dependent Variable: INJ Injury Presentations
Predictors (Constant): BLACK Race (Black)

Multiple R	.122
R Square	.015
Adjusted R Square	.001
Standard Error	.30

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	1.089	.297
Continuity Correction	1	.193	.661
Likelihood Ratio	1	1.943	.163

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.109	.037	
BLACK	-.109	.105	-.122

Dependent Variable: INJ

Dependent Variable: INJ Injury Presentations
Predictors (Constant): CAUCAS Race (Caucasian)

Multiple R	.039
R Square	.002
Adjusted R Square	-.013
Standard Error	.30

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.111	.739
Continuity Correction	1	.000	1.000
Likelihood Ratio	1	.114	.736

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.0800	.060	
CAUCAS	.0242	.074	.039

Dependent Variable: INJ

Dependent Variable: INJ	Injury Presentations
Predictors (Constant): OTHER	Race (Other)

Multiple R	.092
R Square	.008
Adjusted R Square	-.006
Standard Error	.30

Chi-Square Tests

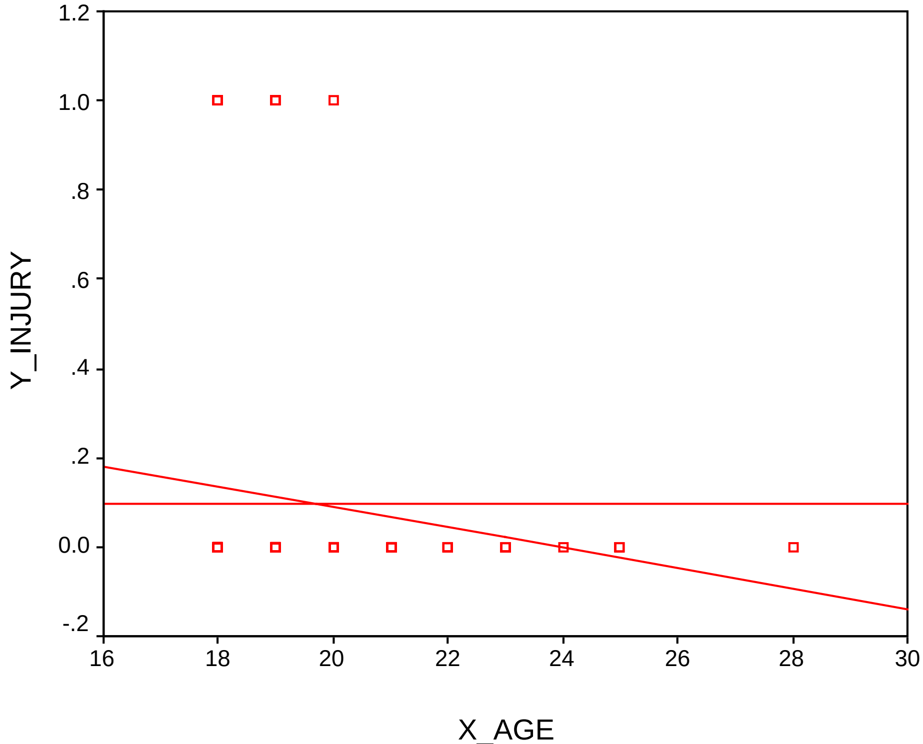
	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.613	.434
Continuity Correction	1	.069	.792
Likelihood Ratio	1	.547	.459

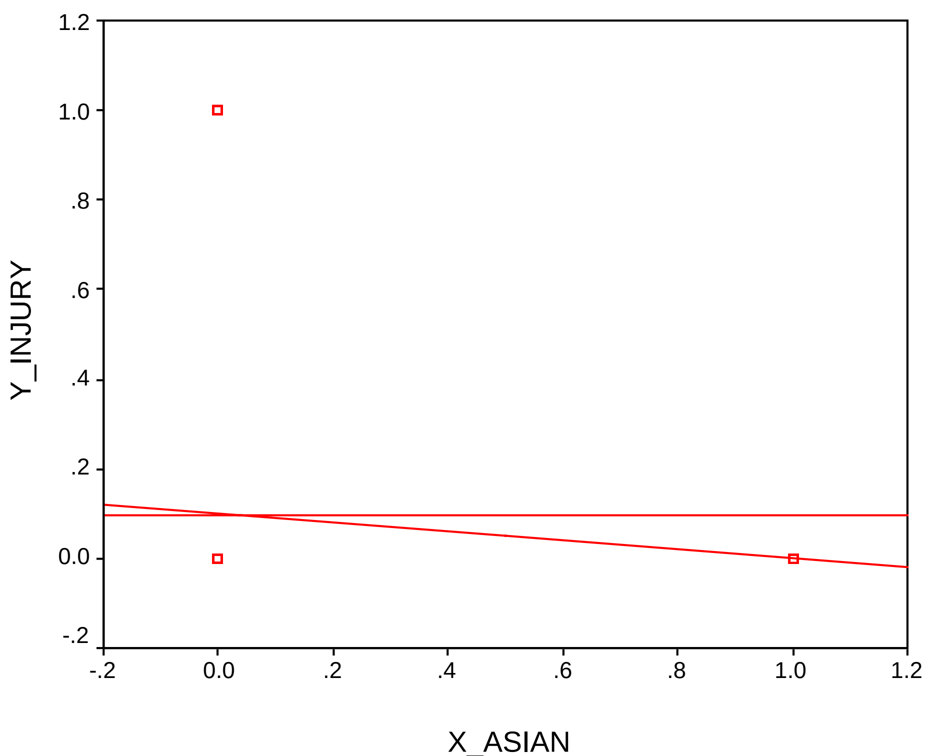
Variables in the Equation

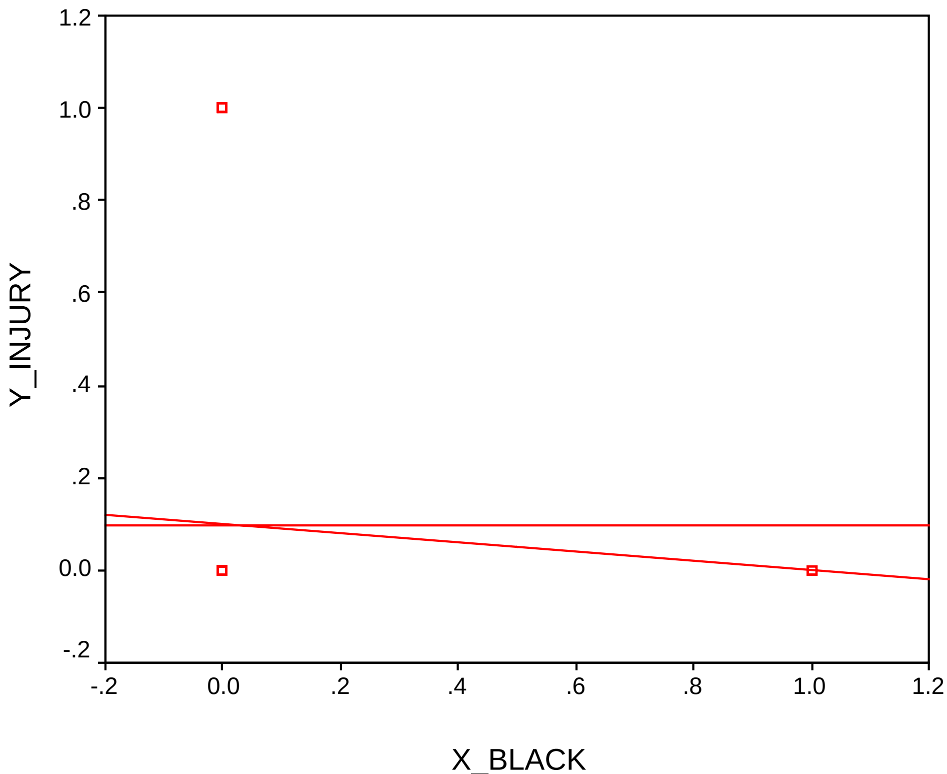
Variable	B	SE B	Beta
(Constant)	.0833	.038	
OTHER	.0705	.091	.092

Dependent Variable: INJ

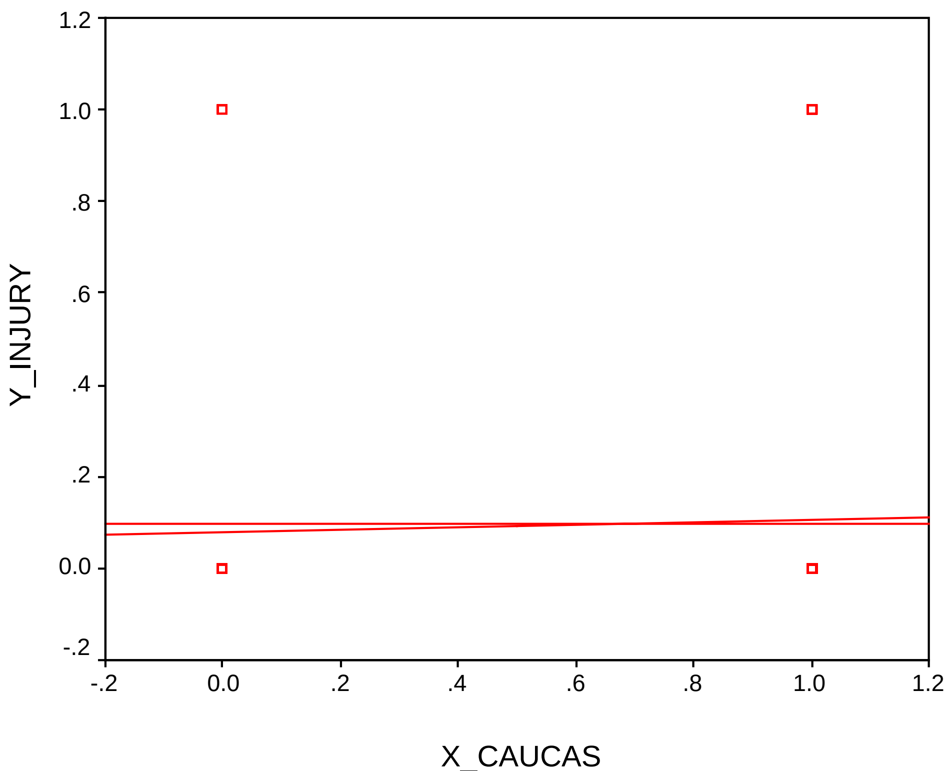
Appendix 9. SPSS Graph – Least-Squares Regression



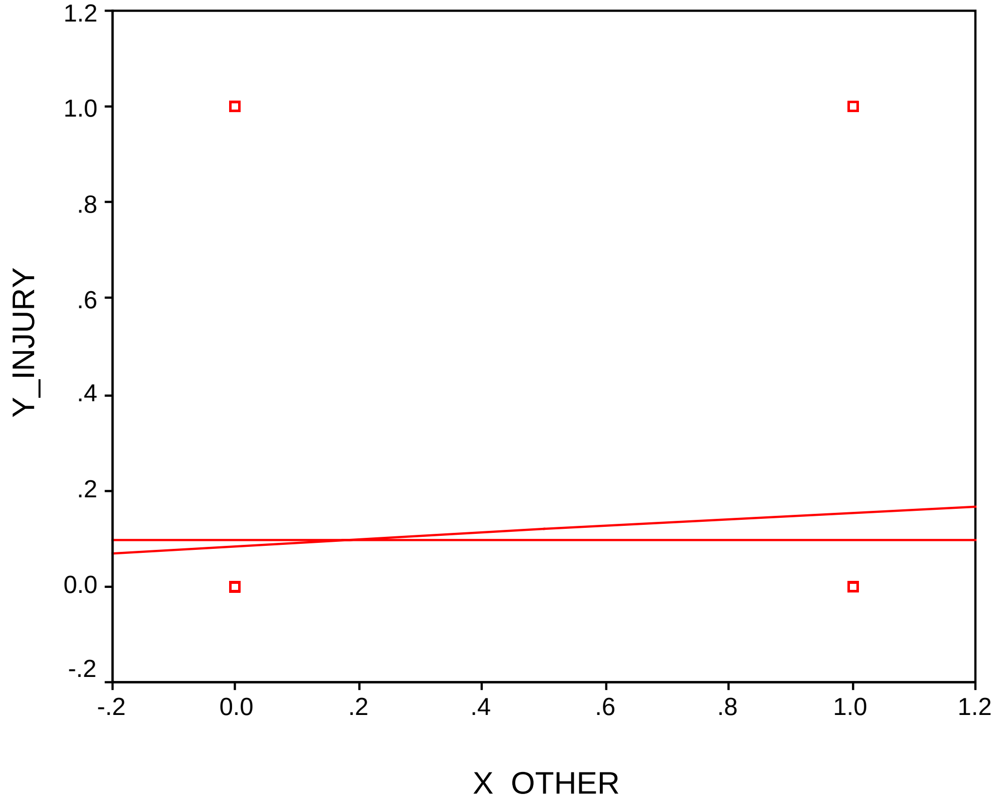




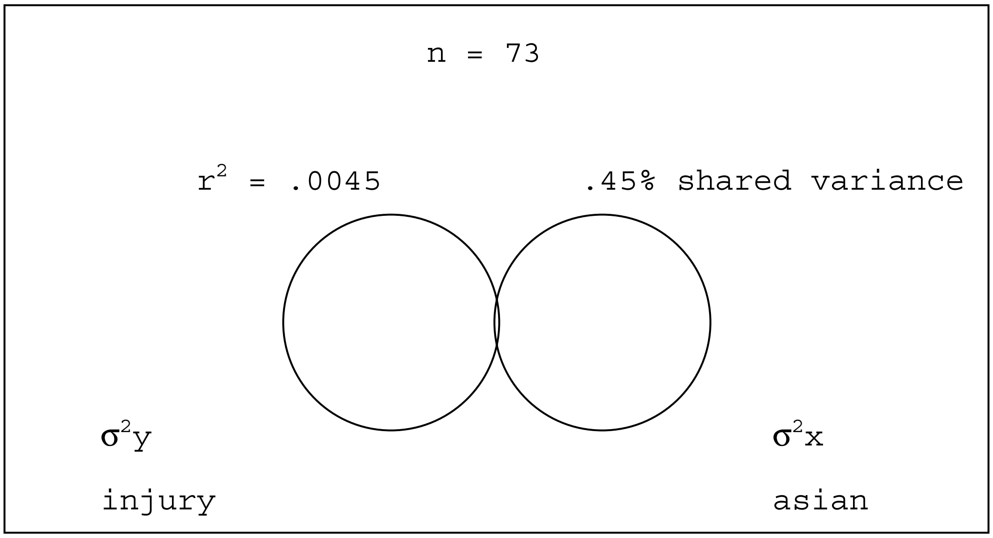
1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_INJURY
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_BLACK



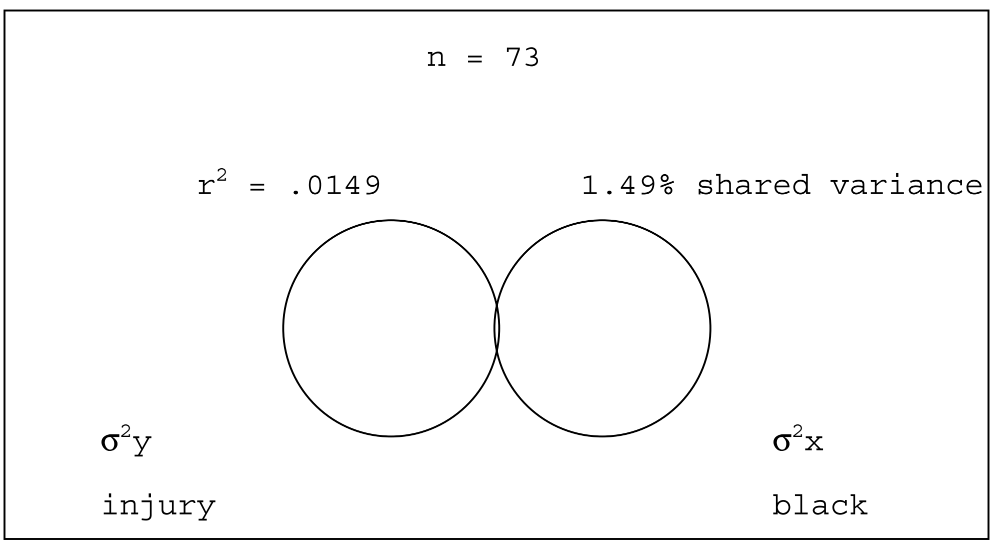
1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_INJURY
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_CAUCAS


1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_INJURY
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_OTHER

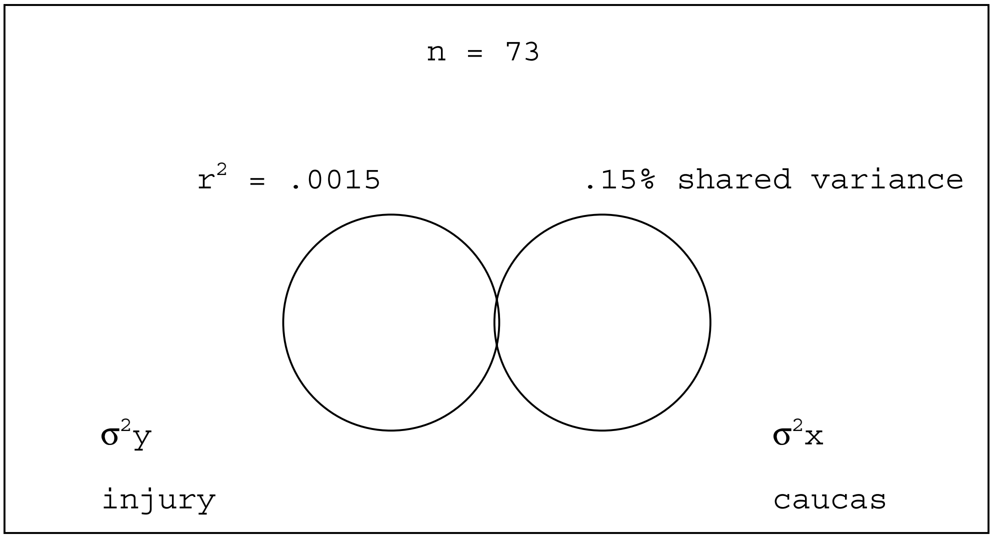
Appendix 10. Venn Diagrams - Correlations for Race



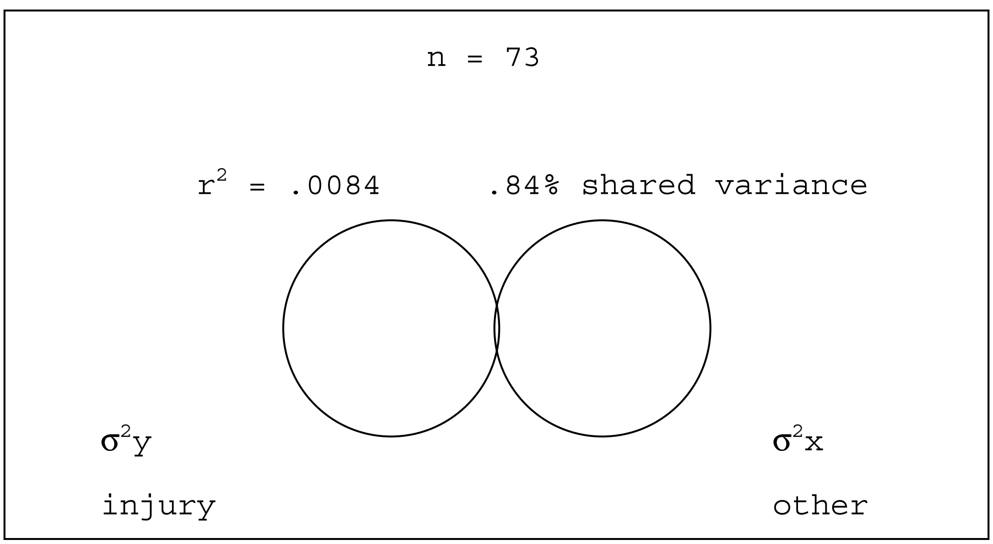
Percent of variance in injuries is accounted for by the variance of race (asian)



Percent of variance in injuries is accounted for by the variance of race (black)



Percent of variance in injuries is accounted for by the variance of race (caucasian)



Percent of variance in injuries is accounted for by the variance of race (other)

Appendix 11. Excel Spreadsheet – AR600-9 Height and Weight Table

Height (in)	Male Age			
	17-20	21-27	28-39	40+
60	132	136	139	141
61	136	140	144	146
62	141	144	148	150
63	145	149	153	155
64	150	154	158	160
65	155	159	163	165
66	160	163	168	170
67	165	169	174	176
68	170	174	179	181
69	175	179	184	186
70	180	185	189	192
71	185	189	194	197
72	190	195	200	203
73	195	200	205	208
74	201	206	211	214
75	206	212	217	220
76	212	217	223	226
77	218	223	229	232
78	223	229	235	238
79	229	235	241	244
80	234	240	247	250

Appendix 12. Excel Spreadsheet – Injury Diagnoses

Diagnosis	Number
Sprains and strains of knee and leg	21
Sprains and strains of ankle and foot	12
Fracture of one or more tarsal and metatarsal bones	3
Superficial injury of hip, thigh, leg, and ankle	1
Superficial injury of foot and toe(s)	1
Fracture of the patella	1
Contusion of trunk	1
Contusion of lower limb and of other and unspecified sites	1

Appendix 13. Excel Spreadsheet – Trainee Roster

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
D102	18	0	20	39	87	0	0	1	0	0	0	0
D103	25	0	29	0	54	0	0	0	0	1	0	0
D104	18	0	24	0	47	0	0	0	0	1	0	0
D105	22	0	37	54	137	0	0	0	0	1	0	0
D106	27	0	42	0	85	0	1	1	0	0	0	0
D108	18	1	66	43	143	0	0	0	0	1	0	0
D109	19	0	32	10	81	0	0	0	0	1	0	0
D115	22	1	47	0	105	0	0	0	0	1	0	0
D116	18	0	49	28	147	0	0	0	0	1	0	0
D118	18	0	20	0	56	0	0	0	0	1	0	0
D120	23	0	47	19	114	0	0	0	0	1	0	0
D121	30	0	37	26	114	0	0	0	0	1	0	0
D122	21	0	57	34	106	0	0	1	0	0	0	0
D127	20	0	77	10	152	0	1	0	0	1	0	0
D130	19	0	38	0	64	0	1	0	0	0	1	0
D132	20	0	37	12	61	0	1	0	0	1	0	0
D136	17	0	46	60	137	0	0	0	0	0	1	0
D138	18	0	66	27	175	0	0	0	1	0	0	0
D139	19	0	59	32	141	0	1	0	0	0	1	0
D140	21	0	20	0	46	0	0	0	0	1	0	0
D142	18	0	21	0	30	0	0	0	0	1	0	0
D143	22	0	65	0	65	0	0	1	0	0	0	0
D144	24	0	30	0	30	0	0	0	0	1	0	0
D146	22	0	53	26	108	1	0	0	0	1	0	0
D147	20	0	49	6	105	1	0	0	0	1	0	0
D150	21	0	30	0	47	0	1	0	0	1	0	0
D151	18	1	31	50	119	0	0	0	0	1	0	0
D152	22	0	61	54	125	0	0	0	0	0	0	1
D201	30	0	40	0	77	0	0	0	0	1	0	0
D202	19	0	20	38	80	0	1	0	0	1	0	0
D203	18	0	38	0	88	0	0	0	0	1	0	0
D205	20	1	41	46	158	0	0	0	0	1	0	0
D207	29	0	44	1	80	0	0	0	0	1	0	0
D208	33	0	47	35	124	0	1	1	0	0	0	0
D209	19	0	28	16	44	0	0	0	0	1	0	0
D210	24	0	36	20	99	0	0	0	0	1	0	0
D211	18	0	46	0	100	0	0	0	0	1	0	0
D212	19	0	48	6	64	0	0	0	0	1	0	0
D213	21	0	38	42	137	0	0	0	0	1	0	0
D214	19	0	54	0	79	0	1	0	0	1	0	0
D215	32	0	50	25	125	0	1	0	0	1	0	0
D216	23	0	46	4	97	0	0	0	0	1	0	0
D219	23	0	67	38	160	0	0	0	0	1	0	0
D220	19	0	49	52	142	0	0	0	0	1	0	0
D225	19	1	52	36	142	0	0	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
D226	26	1	63	1	99	0	0	0	1	0	0	0
D227	19	0	57	6	117	0	0	0	0	1	0	0
D228	19	0	71	59	179	0	1	0	0	1	0	0
D229	28	1	38	55	143	0	0	0	0	1	0	0
D231	17	0	28	0	61	0	0	0	0	1	0	0
D232	20	1	41	0	75	0	1	0	0	1	0	0
D233	18	1	92	68	198	0	0	0	0	1	0	0
D235	19	0	42	52	130	0	0	0	0	1	0	0
D237	18	0	52	67	174	0	0	0	0	1	0	0
D238	19	0	30	61	129	1	0	0	0	1	0	0
D239	31	1	60	62	170	0	0	0	1	0	0	0
D242	19	0	41	27	136	0	0	0	0	1	0	0
D245	32	1	69	21	145	0	1	0	0	1	0	0
D249	17	0	37	16	115	0	0	0	0	1	0	0
D251	19	0	71	72	173	0	0	0	0	1	0	0
D252	18	0	24	0	60	0	0	0	0	1	0	0
D253	24	0	47	18	86	0	1	0	0	0	1	0
D254	22	0	45	18	111	0	0	1	0	0	0	0
D255	22	1	43	44	108	0	1	0	0	1	0	0
D302	18	0	54	64	194	0	0	0	0	1	0	0
D304	19	0	23	0	59	0	0	0	0	1	0	0
D311	17	1	19	35	54	0	0	0	0	1	0	0
D316	18	1	70	53	162	0	1	0	0	1	0	0
D317	22	0	52	0	101	0	1	0	0	1	0	0
D323	19	0	50	35	124	0	0	0	0	1	0	0
D326	19	0	23	100	188	0	0	0	0	1	0	0
D330	19	0	48	30	101	0	0	0	0	1	0	0
D337	18	0	30	0	71	1	0	0	0	1	0	0
D401	19	0	64	0	87	0	1	0	0	1	0	0
D402	18	0	58	0	120	0	0	0	0	0	1	0
D404	24	0	58	41	175	0	0	0	0	1	0	0
D405	18	0	21	30	100	0	0	0	0	1	0	0
D406	18	0	10	0	30	0	0	0	0	1	0	0
D407	20	0	42	8	88	0	1	0	0	1	0	0
D409	21	0	43	81	181	0	0	0	0	1	0	0
D411	19	0	53	28	114	0	0	0	0	1	0	0
D412	25	0	47	0	68	0	1	0	0	1	0	0
D413	18	0	35	0	69	0	0	0	0	1	0	0
D414	18	0	31	56	102	0	1	0	0	1	0	0
D415	25	0	60	60	153	0	0	0	0	1	0	0
D416	20	0	51	64	183	0	0	0	0	1	0	0
D417	20	0	16	0	25	0	0	0	0	1	0	0
D418	18	0	92	38	200	0	0	1	0	0	0	0
D419	19	0	32	0	41	0	0	0	0	1	0	0
D421	25	0	33	64	132	0	0	0	0	1	0	0
D422	19	0	21	63	157	0	0	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
D423	18	0	52	0	99	0	0	0	0	1	0	0
D424	20	0	8	53	70	0	1	0	0	0	0	1
D425	18	0	54	53	149	0	0	0	0	1	0	0
D426	18	0	52	59	147	0	0	0	0	1	0	0
D428	18	0	27	45	111	0	0	0	0	1	0	0
D429	29	0	54	54	141	0	0	0	1	0	0	0
D430	19	0	8	30	60	1	0	0	0	1	0	0
D431	25	0	46	0	77	0	1	0	0	0	1	0
D432	17	0	34	17	89	0	0	0	0	1	0	0
D433	17	0	54	53	141	0	0	0	0	1	0	0
D434	17	0	37	53	128	0	0	0	0	1	0	0
D435	19	1	88	0	105	0	0	0	0	1	0	0
D436	21	0	52	6	102	1	0	0	0	0	1	0
D437	23	0	58	81	195	0	0	0	0	0	1	0
D438	19	0	48	17	122	1	0	0	0	1	0	0
D439	19	0	37	37	120	0	0	0	0	1	0	0
D440	23	0	28	0	28	0	1	0	0	1	0	0
D441	20	0	52	6	84	1	0	0	0	1	0	0
D442	19	0	43	70	173	0	1	0	0	1	0	0
D443	26	0	42	70	168	1	0	0	0	0	1	0
D444	19	1	39	0	59	0	1	0	0	1	0	0
D445	18	0	37	52	115	0	0	0	0	1	0	0
D446	18	0	35	10	60	0	1	0	0	1	0	0
D447	21	0	8	0	41	0	0	0	0	1	0	0
D448	19	0	35	52	136	0	0	0	0	0	1	0
D449	21	0	27	10	49	0	0	0	0	1	0	0
D450	19	1	8	0	17	1	1	0	0	1	0	0
D452	19	0	23	1	65	1	0	0	0	1	0	0
D453	20	1	67	52	158	0	0	0	1	0	0	0
D454	25	1	28	9	62	0	1	0	0	1	0	0
D455	22	0	76	34	178	1	0	0	0	1	0	0
E103	18	0	13	39	66	0	0	0	0	0	0	1
E104	22	0	50	39	89	0	1	0	1	0	0	0
E105	20	1	46	19	96	1	0	0	0	1	0	0
E107	20	0	48	37	95	0	0	0	0	1	0	0
E109	19	1	26	14	50	0	0	0	0	1	0	0
E111	19	0	48	32	127	0	0	0	0	1	0	0
E113	20	0	46	50	150	0	0	0	0	1	0	0
E114	27	0	57	51	164	0	0	0	0	1	0	0
E116	27	0	52	54	160	0	0	0	0	0	0	1
E117	20	0	50	39	117	0	0	0	0	1	0	0
E119	25	0	44	46	142	0	0	0	1	0	0	0
E120	19	0	45	0	92	0	0	0	0	1	0	0
E121	18	0	37	0	60	1	0	0	0	1	0	0
E122	18	0	37	0	59	0	1	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
E123	23	0	66	0	101	0	0	0	0	0	0	1
E124	17	0	43	0	68	0	1	0	0	1	0	0
E125	20	0	28	0	59	0	1	0	0	1	0	0
E126	20	0	75	24	99	0	0	0	1	0	0	0
E127	19	0	72	79	214	0	0	0	0	1	0	0
E129	18	0	12	0	54	0	1	0	0	0	0	1
E130	20	0	26	17	58	0	0	0	0	1	0	0
E131	23	0	44	22	98	1	0	0	0	1	0	0
E132	19	0	34	14	114	0	0	0	0	1	0	0
E133	18	0	34	31	65	1	0	0	0	1	0	0
E134	19	0	16	50	91	0	0	0	0	1	0	0
E135	23	0	33	39	104	0	0	0	0	1	0	0
E137	19	0	46	46	129	0	0	0	0	1	0	0
E138	20	0	54	27	111	0	0	0	0	1	0	0
E139	18	0	67	28	133	1	0	0	0	1	0	0
E140	29	0	32	0	32	1	1	0	1	0	0	0
E141	19	0	34	24	105	0	0	0	0	1	0	0
E143	18	0	32	50	144	0	0	0	0	1	0	0
E144	20	1	31	0	54	0	1	0	0	1	0	0
E145	18	0	24	0	79	0	0	0	0	1	0	0
E146	19	1	52	27	104	0	0	0	0	1	0	0
E147	24	0	23	1	24	0	0	0	1	0	0	0
E148	20	0	63	0	77	0	0	0	0	0	1	0
E149	21	0	37	13	86	0	1	0	0	0	0	1
E151	18	0	32	0	52	0	0	0	0	1	0	0
E152	20	0	70	41	125	1	0	0	0	1	0	0
E154	20	0	52	28	80	0	0	0	0	1	0	0
E201	20	0	31	0	31	1	1	0	0	0	1	0
E202	22	0	34	63	137	0	0	0	0	1	0	0
E203	18	0	28	8	53	0	1	0	0	1	0	0
E204	19	0	57	41	124	0	0	0	0	1	0	0
E205	20	0	30	0	64	1	0	0	0	1	0	0
E206	20	0	48	24	134	0	0	0	0	1	0	0
E207	18	0	19	0	19	0	0	0	0	0	0	1
E208	20	1	43	0	69	1	0	0	0	1	0	0
E209	22	0	73	71	192	0	0	0	0	1	0	0
E210	19	0	32	0	55	0	0	0	0	1	0	0
E211	17	0	60	21	115	0	0	0	0	1	0	0
E212	18	1	9	0	9	0	1	0	0	1	0	0
E213	19	0	20	23	77	0	0	0	0	1	0	0
E214	21	1	52	86	214	0	1	0	0	1	0	0
E215	21	1	31	0	31	0	1	0	0	1	0	0
E219	25	0	42	34	102	0	0	0	0	1	0	0
E222	21	0	13	0	39	0	0	0	0	1	0	0
E223	17	0	50	8	105	0	0	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
E224	21	0	38	0	69	0	1	0	0	0	0	1
E225	25	1	68	68	196	0	1	0	0	1	0	0
E226	19	0	30	39	127	0	0	0	1	0	0	0
E227	19	0	43	0	73	0	0	0	0	1	0	0
E228	17	0	20	0	48	0	0	1	0	0	0	0
E229	18	0	32	45	124	0	0	0	0	1	0	0
E230	17	0	39	0	72	0	0	0	0	1	0	0
E231	26	1	23	43	116	0	0	0	0	1	0	0
E232	19	0	24	0	38	0	1	0	0	1	0	0
E233	20	0	43	16	84	0	0	0	0	1	0	0
E234	24	1	46	39	153	0	0	0	0	1	0	0
E235	18	0	38	12	65	0	0	0	0	1	0	0
E236	17	1	16	0	55	0	1	0	0	1	0	0
E237	29	1	86	71	233	0	0	0	0	1	0	0
E238	25	1	38	0	74	0	1	0	0	0	1	0
E239	20	0	52	24	112	0	0	0	0	1	0	0
E240	22	0	51	56	150	0	1	0	0	1	0	0
E241	20	0	60	31	127	0	0	0	1	0	0	0
E243	18	0	21	38	102	1	0	0	0	1	0	0
E244	18	0	53	13	112	0	0	0	0	1	0	0
E246	19	0	32	43	95	0	1	0	0	1	0	0
E247	22	0	70	0	127	0	0	0	1	0	0	0
E248	19	0	10	0	48	0	0	0	0	1	0	0
E249	18	0	39	45	102	0	0	0	0	1	0	0
E250	31	1	60	26	158	0	1	0	1	0	0	0
E251	26	0	79	86	241	0	0	0	1	0	0	0
E252	17	1	52	71	186	0	0	0	0	1	0	0
E253	20	0	26	28	77	0	0	0	0	1	0	0
E254	23	0	57	0	100	0	0	0	0	1	0	0
E255	21	0	27	0	84	0	0	1	0	0	0	0
E301	20	1	60	38	166	0	0	0	0	0	1	0
E302	19	0	24	13	92	0	0	0	0	1	0	0
E303	25	0	62	31	137	0	1	0	0	1	0	0
E304	20	0	56	17	128	0	0	0	0	0	1	0
E305	21	0	46	8	79	1	0	0	0	1	0	0
E307	25	0	70	48	168	0	1	0	0	1	0	0
E308	19	0	60	20	95	0	0	0	0	1	0	0
E309	18	0	13	6	71	0	0	0	0	1	0	0
E310	21	1	35	6	67	0	1	0	0	1	0	0
E312	19	1	48	30	103	0	0	0	0	1	0	0
E313	19	0	14	32	74	0	0	0	0	1	0	0
E314	30	0	66	61	173	0	0	0	0	1	0	0
E315	22	0	62	63	201	0	0	0	1	0	0	0
E316	21	1	71	32	142	0	0	0	0	1	0	0
E317	18	0	72	27	154	0	0	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
E318	17	0	53	66	190	0	1	0	0	1	0	0
E319	20	0	46	13	77	0	0	0	0	1	0	0
E320	27	0	40	24	109	1	0	0	0	1	0	0
E321	19	0	60	32	141	0	0	0	0	1	0	0
E322	24	1	50	48	139	0	0	0	0	1	0	0
E323	21	0	70	64	180	0	0	0	0	0	1	0
E324	21	1	48	70	189	0	0	0	0	1	0	0
E325	19	0	48	82	153	0	0	0	0	1	0	0
E327	19	1	32	61	148	0	1	0	0	1	0	0
E328	18	0	27	42	118	1	0	0	0	1	0	0
E329	23	0	25	42	67	0	0	0	0	1	0	0
E330	20	0	41	45	135	0	1	0	0	1	0	0
E331	18	0	38	34	105	1	0	0	0	1	0	0
E334	19	0	68	0	101	0	0	0	0	1	0	0
E335	25	0	33	0	33	0	1	0	0	1	0	0
E336	18	0	30	46	114	1	0	0	1	0	0	0
E337	19	0	45	28	106	1	1	0	0	0	1	0
E338	19	0	41	0	61	0	0	0	1	0	0	0
E339	26	0	44	21	115	1	0	0	0	1	0	0
E340	18	0	57	56	136	1	0	0	0	0	1	0
E341	22	0	65	79	165	0	0	0	1	0	0	0
E342	20	1	88	100	256	0	0	0	0	1	0	0
E343	26	0	43	50	134	0	0	0	0	1	0	0
E344	21	0	66	92	229	0	0	0	0	0	1	0
E345	24	0	30	34	64	0	0	0	0	1	0	0
E346	26	0	34	47	121	0	0	0	0	1	0	0
E347	18	0	57	50	161	0	0	0	0	0	1	0
E348	18	0	75	99	247	0	0	0	0	1	0	0
E349	22	0	51	61	168	0	0	0	0	1	0	0
E350	25	1	49	37	119	1	0	0	0	1	0	0
E351	20	0	43	8	84	0	0	0	0	1	0	0
E352	18	0	39	45	84	0	0	0	1	0	0	0
E353	19	1	39	0	81	1	1	0	0	1	0	0
E354	19	1	26	6	55	0	0	0	0	1	0	0
E355	23	1	44	87	208	1	0	0	0	1	0	0
E356	19	1	38	26	113	0	1	0	0	1	0	0
E401	19	0	0	0	0	0	1	0	0	1	0	0
E402	23	0	74	51	201	0	0	0	0	1	0	0
E403	30	1	42	54	146	0	1	0	0	1	0	0
E404	18	1	23	54	103	0	0	0	0	1	0	0
E406	18	0	34	30	97	0	0	0	0	1	0	0
E407	19	0	52	31	106	0	0	0	0	1	0	0
E408	23	0	27	0	27	0	1	0	0	1	0	0
E409	35	0	68	56	176	0	0	0	0	1	0	0
E410	18	0	13	0	13	0	0	0	0	1	0	0

RN	AGE	HX	PU	RUN	SCORE	INJ	WGHT	ASIAN	BLACK	CAUCAS	HISP	OTHER
E411	20	0	31	6	55	0	0	0	0	1	0	0
E412	18	1	21	0	31	0	1	0	0	1	0	0
E413	21	0	39	13	80	0	0	0	0	1	0	0
E414	20	0	41	17	100	0	0	0	0	1	0	0
E415	20	1	32	49	131	0	0	0	0	1	0	0
E416	23	1	35	37	101	0	0	0	0	1	0	0
E417	20	0	45	54	146	0	0	0	0	0	1	0
E418	27	0	20	33	53	1	0	0	0	0	1	0
E419	18	0	71	63	188	0	0	0	0	1	0	0
E421	19	1	5	0	5	0	1	0	0	1	0	0
E424	22	1	21	42	116	0	0	0	0	1	0	0
E426	19	1	63	50	168	0	0	0	0	1	0	0
E427	20	0	38	19	71	0	0	0	0	0	1	0
E428	18	0	30	35	112	0	0	0	0	1	0	0
E429	18	0	45	0	100	0	0	1	0	0	0	0
E431	18	0	54	83	181	0	0	1	0	0	0	0
E432	19	1	42	12	88	0	0	0	1	0	0	0
E433	18	0	24	0	54	0	0	0	0	1	0	0
E434	19	0	17	27	44	0	0	0	0	1	0	0
E435	19	0	34	2	36	0	0	0	1	0	0	0
E436	19	0	37	24	87	0	0	0	0	1	0	0
E438	18	0	46	63	183	0	0	0	0	1	0	0
E439	20	1	39	35	112	0	0	0	0	1	0	0
E440	22	0	38	49	144	0	0	0	0	1	0	0
E441	27	0	28	4	75	0	1	0	0	1	0	0
E442	17	0	19	0	60	0	0	0	0	1	0	0
E444	21	1	41	56	97	0	0	0	0	1	0	0
E445	21	1	24	14	61	0	0	0	0	1	0	0
E446	18	0	45	12	75	0	1	0	1	0	0	0
E447	18	1	16	0	41	0	1	0	0	1	0	0
E448	18	1	42	50	92	0	0	0	0	1	0	0
E449	28	0	46	55	160	0	0	0	0	1	0	0
E450	19	0	12	0	40	0	1	0	0	1	0	0
E451	18	0	34	61	136	0	0	0	0	1	0	0
E452	19	1	30	24	104	0	0	0	0	1	0	0
E454	19	0	13	0	13	0	1	0	0	1	0	0
E455	20	0	9	0	31	0	0	1	0	0	0	0
E456	19	0	39	21	86	0	1	0	0	1	0	0

Appendix 14. Excel Spreadsheet Computer Data Files

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
D102	0	18	0	0	0	20	0	39	0	87	0
D103	0	25	0	0	0	29	0	0	0	54	0
D104	0	18	0	0	0	24	0	0	0	47	0
D105	0	22	0	0	0	37	0	54	0	137	0
D106	0	27	0	0	0	42	0	0	0	85	0
D108	0	18	0	1	0	66	0	43	0	143	0
D109	0	19	0	0	0	32	0	10	0	81	0
D115	0	22	0	1	0	47	0	0	0	105	0
D116	0	18	0	0	0	49	0	28	0	147	0
D118	0	18	0	0	0	20	0	0	0	56	0
D120	0	23	0	0	0	47	0	19	0	114	0
D121	0	30	0	0	0	37	0	26	0	114	0
D122	0	21	0	0	0	57	0	34	0	106	0
D127	0	20	0	0	0	77	0	10	0	152	0
D130	0	19	0	0	0	38	0	0	0	64	0
D132	0	20	0	0	0	37	0	12	0	61	0
D136	0	17	0	0	0	46	0	60	0	137	0
D138	0	18	0	0	0	66	0	27	0	175	0
D139	0	19	0	0	0	59	0	32	0	141	0
D140	0	21	0	0	0	20	0	0	0	46	0
D142	0	18	0	0	0	21	0	0	0	30	0
D143	0	22	0	0	0	65	0	0	0	65	0
D144	0	24	0	0	0	30	0	0	0	30	0
D146	1	22	22	0	0	53	53	26	26	108	108
D147	1	20	20	0	0	49	49	6	6	105	105
D150	0	21	0	0	0	30	0	0	0	47	0
D151	0	18	0	1	0	31	0	50	0	119	0
D152	0	22	0	0	0	61	0	54	0	125	0
D201	0	30	0	0	0	40	0	0	0	77	0
D202	0	19	0	0	0	20	0	38	0	80	0
D203	0	18	0	0	0	38	0	0	0	88	0
D205	0	20	0	1	0	41	0	46	0	158	0
D207	0	29	0	0	0	44	0	1	0	80	0
D208	0	33	0	0	0	47	0	35	0	124	0
D209	0	19	0	0	0	28	0	16	0	44	0
D210	0	24	0	0	0	36	0	20	0	99	0
D211	0	18	0	0	0	46	0	0	0	100	0
D212	0	19	0	0	0	48	0	6	0	64	0
D213	0	21	0	0	0	38	0	42	0	137	0
D214	0	19	0	0	0	54	0	0	0	79	0
D215	0	32	0	0	0	50	0	25	0	125	0
D216	0	23	0	0	0	46	0	4	0	97	0
D219	0	23	0	0	0	67	0	38	0	160	0
D220	0	19	0	0	0	49	0	52	0	142	0
D225	0	19	0	1	0	52	0	36	0	142	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
D226	0	26	0	1	0	63	0	1	0	99	0
D227	0	19	0	0	0	57	0	6	0	117	0
D228	0	19	0	0	0	71	0	59	0	179	0
D229	0	28	0	1	0	38	0	55	0	143	0
D231	0	17	0	0	0	28	0	0	0	61	0
D232	0	20	0	1	0	41	0	0	0	75	0
D233	0	18	0	1	0	92	0	68	0	198	0
D235	0	19	0	0	0	42	0	52	0	130	0
D237	0	18	0	0	0	52	0	67	0	174	0
D238	1	19	19	0	0	30	30	61	61	129	129
D239	0	31	0	1	0	60	0	62	0	170	0
D242	0	19	0	0	0	41	0	27	0	136	0
D245	0	32	0	1	0	69	0	21	0	145	0
D249	0	17	0	0	0	37	0	16	0	115	0
D251	0	19	0	0	0	71	0	72	0	173	0
D252	0	18	0	0	0	24	0	0	0	60	0
D253	0	24	0	0	0	47	0	18	0	86	0
D254	0	22	0	0	0	45	0	18	0	111	0
D255	0	22	0	1	0	43	0	44	0	108	0
D302	0	18	0	0	0	54	0	64	0	194	0
D304	0	19	0	0	0	23	0	0	0	59	0
D311	0	17	0	1	0	19	0	35	0	54	0
D316	0	18	0	1	0	70	0	53	0	162	0
D317	0	22	0	0	0	52	0	0	0	101	0
D323	0	19	0	0	0	50	0	35	0	124	0
D326	0	19	0	0	0	23	0	100	0	188	0
D330	0	19	0	0	0	48	0	30	0	101	0
D337	1	18	18	0	0	30	30	0	0	71	71
D401	0	19	0	0	0	64	0	0	0	87	0
D402	0	18	0	0	0	58	0	0	0	120	0
D404	0	24	0	0	0	58	0	41	0	175	0
D405	0	18	0	0	0	21	0	30	0	100	0
D406	0	18	0	0	0	10	0	0	0	30	0
D407	0	20	0	0	0	42	0	8	0	88	0
D409	0	21	0	0	0	43	0	81	0	181	0
D411	0	19	0	0	0	53	0	28	0	114	0
D412	0	25	0	0	0	47	0	0	0	68	0
D413	0	18	0	0	0	35	0	0	0	69	0
D414	0	18	0	0	0	31	0	56	0	102	0
D415	0	25	0	0	0	60	0	60	0	153	0
D416	0	20	0	0	0	51	0	64	0	183	0
D417	0	20	0	0	0	16	0	0	0	25	0
D418	0	18	0	0	0	92	0	38	0	200	0
D419	0	19	0	0	0	32	0	0	0	41	0
D421	0	25	0	0	0	33	0	64	0	132	0
D422	0	19	0	0	0	21	0	63	0	157	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
D423	0	18	0	0	0	52	0	0	0	99	0
D424	0	20	0	0	0	8	0	53	0	70	0
D425	0	18	0	0	0	54	0	53	0	149	0
D426	0	18	0	0	0	52	0	59	0	147	0
D428	0	18	0	0	0	27	0	45	0	111	0
D429	0	29	0	0	0	54	0	54	0	141	0
D430	1	19	19	0	0	8	8	30	30	60	60
D431	0	25	0	0	0	46	0	0	0	77	0
D432	0	17	0	0	0	34	0	17	0	89	0
D433	0	17	0	0	0	54	0	53	0	141	0
D434	0	17	0	0	0	37	0	53	0	128	0
D435	0	19	0	1	0	88	0	0	0	105	0
D436	1	21	21	0	0	52	52	6	6	102	102
D437	0	23	0	0	0	58	0	81	0	195	0
D438	1	19	19	0	0	48	48	17	17	122	122
D439	0	19	0	0	0	37	0	37	0	120	0
D440	0	23	0	0	0	28	0	0	0	28	0
D441	1	20	20	0	0	52	52	6	6	84	84
D442	0	19	0	0	0	43	0	70	0	173	0
D443	1	26	26	0	0	42	42	70	70	168	168
D444	0	19	0	1	0	39	0	0	0	59	0
D445	0	18	0	0	0	37	0	52	0	115	0
D446	0	18	0	0	0	35	0	10	0	60	0
D447	0	21	0	0	0	8	0	0	0	41	0
D448	0	19	0	0	0	35	0	52	0	136	0
D449	0	21	0	0	0	27	0	10	0	49	0
D450	1	19	19	1	1	8	8	0	0	17	17
D452	1	19	19	0	0	23	23	1	1	65	65
D453	0	20	0	1	0	67	0	52	0	158	0
D454	0	25	0	1	0	28	0	9	0	62	0
D455	1	22	22	0	0	76	76	34	34	178	178
E103	0	18	0	0	0	13	0	39	0	66	0
E104	0	22	0	0	0	50	0	39	0	89	0
E105	1	20	20	1	1	46	46	19	19	96	96
E107	0	20	0	0	0	48	0	37	0	95	0
E109	0	19	0	1	0	26	0	14	0	50	0
E111	0	19	0	0	0	48	0	32	0	127	0
E113	0	20	0	0	0	46	0	50	0	150	0
E114	0	27	0	0	0	57	0	51	0	164	0
E116	0	27	0	0	0	52	0	54	0	160	0
E117	0	20	0	0	0	50	0	39	0	117	0
E119	0	25	0	0	0	44	0	46	0	142	0
E120	0	19	0	0	0	45	0	0	0	92	0
E121	1	18	18	0	0	37	37	0	0	60	60
E122	0	18	0	0	0	37	0	0	0	59	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
E123	0	23	0	0	0	66	0	0	0	101	0
E124	0	17	0	0	0	43	0	0	0	68	0
E125	0	20	0	0	0	28	0	0	0	59	0
E126	0	20	0	0	0	75	0	24	0	99	0
E127	0	19	0	0	0	72	0	79	0	214	0
E129	0	18	0	0	0	12	0	0	0	54	0
E130	0	20	0	0	0	26	0	17	0	58	0
E131	1	23	23	0	0	44	44	22	22	98	98
E132	0	19	0	0	0	34	0	14	0	114	0
E133	1	18	18	0	0	34	34	31	31	65	65
E134	0	19	0	0	0	16	0	50	0	91	0
E135	0	23	0	0	0	33	0	39	0	104	0
E137	0	19	0	0	0	46	0	46	0	129	0
E138	0	20	0	0	0	54	0	27	0	111	0
E139	1	18	18	0	0	67	67	28	28	133	133
E140	1	29	29	0	0	32	32	0	0	32	32
E141	0	19	0	0	0	34	0	24	0	105	0
E143	0	18	0	0	0	32	0	50	0	144	0
E144	0	20	0	1	0	31	0	0	0	54	0
E145	0	18	0	0	0	24	0	0	0	79	0
E146	0	19	0	1	0	52	0	27	0	104	0
E147	0	24	0	0	0	23	0	1	0	24	0
E148	0	20	0	0	0	63	0	0	0	77	0
E149	0	21	0	0	0	37	0	13	0	86	0
E151	0	18	0	0	0	32	0	0	0	52	0
E152	1	20	20	0	0	70	70	41	41	125	125
E154	0	20	0	0	0	52	0	28	0	80	0
E201	1	20	20	0	0	31	31	0	0	31	31
E202	0	22	0	0	0	34	0	63	0	137	0
E203	0	18	0	0	0	28	0	8	0	53	0
E204	0	19	0	0	0	57	0	41	0	124	0
E205	1	20	20	0	0	30	30	0	0	64	64
E206	0	20	0	0	0	48	0	24	0	134	0
E207	0	18	0	0	0	19	0	0	0	19	0
E208	1	20	20	1	1	43	43	0	0	69	69
E209	0	22	0	0	0	73	0	71	0	192	0
E210	0	19	0	0	0	32	0	0	0	55	0
E211	0	17	0	0	0	60	0	21	0	115	0
E212	0	18	0	1	0	9	0	0	0	9	0
E213	0	19	0	0	0	20	0	23	0	77	0
E214	0	21	0	1	0	52	0	86	0	214	0
E215	0	21	0	1	0	31	0	0	0	31	0
E219	0	25	0	0	0	42	0	34	0	102	0
E222	0	21	0	0	0	13	0	0	0	39	0
E223	0	17	0	0	0	50	0	8	0	105	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
E224	0	21	0	0	0	38	0	0	0	69	0
E225	0	25	0	1	0	68	0	68	0	196	0
E226	0	19	0	0	0	30	0	39	0	127	0
E227	0	19	0	0	0	43	0	0	0	73	0
E228	0	17	0	0	0	20	0	0	0	48	0
E229	0	18	0	0	0	32	0	45	0	124	0
E230	0	17	0	0	0	39	0	0	0	72	0
E231	0	26	0	1	0	23	0	43	0	116	0
E232	0	19	0	0	0	24	0	0	0	38	0
E233	0	20	0	0	0	43	0	16	0	84	0
E234	0	24	0	1	0	46	0	39	0	153	0
E235	0	18	0	0	0	38	0	12	0	65	0
E236	0	17	0	1	0	16	0	0	0	55	0
E237	0	29	0	1	0	86	0	71	0	233	0
E238	0	25	0	1	0	38	0	0	0	74	0
E239	0	20	0	0	0	52	0	24	0	112	0
E240	0	22	0	0	0	51	0	56	0	150	0
E241	0	20	0	0	0	60	0	31	0	127	0
E243	1	18	18	0	0	21	21	38	38	102	102
E244	0	18	0	0	0	53	0	13	0	112	0
E246	0	19	0	0	0	32	0	43	0	95	0
E247	0	22	0	0	0	70	0	0	0	127	0
E248	0	19	0	0	0	10	0	0	0	48	0
E249	0	18	0	0	0	39	0	45	0	102	0
E250	0	31	0	1	0	60	0	26	0	158	0
E251	0	26	0	0	0	79	0	86	0	241	0
E252	0	17	0	1	0	52	0	71	0	186	0
E253	0	20	0	0	0	26	0	28	0	77	0
E254	0	23	0	0	0	57	0	0	0	100	0
E255	0	21	0	0	0	27	0	0	0	84	0
E301	0	20	0	1	0	60	0	38	0	166	0
E302	0	19	0	0	0	24	0	13	0	92	0
E303	0	25	0	0	0	62	0	31	0	137	0
E304	0	20	0	0	0	56	0	17	0	128	0
E305	1	21	21	0	0	46	46	8	8	79	79
E307	0	25	0	0	0	70	0	48	0	168	0
E308	0	19	0	0	0	60	0	20	0	95	0
E309	0	18	0	0	0	13	0	6	0	71	0
E310	0	21	0	1	0	35	0	6	0	67	0
E312	0	19	0	1	0	48	0	30	0	103	0
E313	0	19	0	0	0	14	0	32	0	74	0
E314	0	30	0	0	0	66	0	61	0	173	0
E315	0	22	0	0	0	62	0	63	0	201	0
E316	0	21	0	1	0	71	0	32	0	142	0
E317	0	18	0	0	0	72	0	27	0	154	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
E318	0	17	0	0	0	53	0	66	0	190	0
E319	0	20	0	0	0	46	0	13	0	77	0
E320	1	27	27	0	0	40	40	24	24	109	109
E321	0	19	0	0	0	60	0	32	0	141	0
E322	0	24	0	1	0	50	0	48	0	139	0
E323	0	21	0	0	0	70	0	64	0	180	0
E324	0	21	0	1	0	48	0	70	0	189	0
E325	0	19	0	0	0	48	0	82	0	153	0
E327	0	19	0	1	0	32	0	61	0	148	0
E328	1	18	18	0	0	27	27	42	42	118	118
E329	0	23	0	0	0	25	0	42	0	67	0
E330	0	20	0	0	0	41	0	45	0	135	0
E331	1	18	18	0	0	38	38	34	34	105	105
E334	0	19	0	0	0	68	0	0	0	101	0
E335	0	25	0	0	0	33	0	0	0	33	0
E336	1	18	18	0	0	30	30	46	46	114	114
E337	1	19	19	0	0	45	45	28	28	106	106
E338	0	19	0	0	0	41	0	0	0	61	0
E339	1	26	26	0	0	44	44	21	21	115	115
E340	1	18	18	0	0	57	57	56	56	136	136
E341	0	22	0	0	0	65	0	79	0	165	0
E342	0	20	0	1	0	88	0	100	0	256	0
E343	0	26	0	0	0	43	0	50	0	134	0
E344	0	21	0	0	0	66	0	92	0	229	0
E345	0	24	0	0	0	30	0	34	0	64	0
E346	0	26	0	0	0	34	0	47	0	121	0
E347	0	18	0	0	0	57	0	50	0	161	0
E348	0	18	0	0	0	75	0	99	0	247	0
E349	0	22	0	0	0	51	0	61	0	168	0
E350	1	25	25	1	1	49	49	37	37	119	119
E351	0	20	0	0	0	43	0	8	0	84	0
E352	0	18	0	0	0	39	0	45	0	84	0
E353	1	19	19	1	1	39	39	0	0	81	81
E354	0	19	0	1	0	26	0	6	0	55	0
E355	1	23	23	1	1	44	44	87	87	208	208
E356	0	19	0	1	0	38	0	26	0	113	0
E401	0	19	0	0	0	0	0	0	0	0	0
E402	0	23	0	0	0	74	0	51	0	201	0
E403	0	30	0	1	0	42	0	54	0	146	0
E404	0	18	0	1	0	23	0	54	0	103	0
E406	0	18	0	0	0	34	0	30	0	97	0
E407	0	19	0	0	0	52	0	31	0	106	0
E408	0	23	0	0	0	27	0	0	0	27	0
E409	0	35	0	0	0	68	0	56	0	176	0
E410	0	18	0	0	0	13	0	0	0	13	0

RN	Y(INJ)	X(AGE)	X*Y	X(HX)	X*Y	X(PU)	X*Y	X(RUN)	X*Y	X(SCORE)	X*Y
E411	0	20	0	0	0	31	0	6	0	55	0
E412	0	18	0	1	0	21	0	0	0	31	0
E413	0	21	0	0	0	39	0	13	0	80	0
E414	0	20	0	0	0	41	0	17	0	100	0
E415	0	20	0	1	0	32	0	49	0	131	0
E416	0	23	0	1	0	35	0	37	0	101	0
E417	0	20	0	0	0	45	0	54	0	146	0
E418	1	27	27	0	0	20	20	33	33	53	53
E419	0	18	0	0	0	71	0	63	0	188	0
E421	0	19	0	1	0	5	0	0	0	5	0
E424	0	22	0	1	0	21	0	42	0	116	0
E426	0	19	0	1	0	63	0	50	0	168	0
E427	0	20	0	0	0	38	0	19	0	71	0
E428	0	18	0	0	0	30	0	35	0	112	0
E429	0	18	0	0	0	45	0	0	0	100	0
E431	0	18	0	0	0	54	0	83	0	181	0
E432	0	19	0	1	0	42	0	12	0	88	0
E433	0	18	0	0	0	24	0	0	0	54	0
E434	0	19	0	0	0	17	0	27	0	44	0
E435	0	19	0	0	0	34	0	2	0	36	0
E436	0	19	0	0	0	37	0	24	0	87	0
E438	0	18	0	0	0	46	0	63	0	183	0
E439	0	20	0	1	0	39	0	35	0	112	0
E440	0	22	0	0	0	38	0	49	0	144	0
E441	0	27	0	0	0	28	0	4	0	75	0
E442	0	17	0	0	0	19	0	0	0	60	0
E444	0	21	0	1	0	41	0	56	0	97	0
E445	0	21	0	1	0	24	0	14	0	61	0
E446	0	18	0	0	0	45	0	12	0	75	0
E447	0	18	0	1	0	16	0	0	0	41	0
E448	0	18	0	1	0	42	0	50	0	92	0
E449	0	28	0	0	0	46	0	55	0	160	0
E450	0	19	0	0	0	12	0	0	0	40	0
E451	0	18	0	0	0	34	0	61	0	136	0
E452	0	19	0	1	0	30	0	24	0	104	0
E454	0	19	0	0	0	13	0	0	0	13	0
E455	0	20	0	0	0	9	0	0	0	31	0
E456	0	19	0	0	0	39	0	21	0	86	0
Sums:	35	6377	727	63	6	12995	1405	8777	852	32941	3427
Mean:	0.1133	20.6375		0.2039		42.0550		28.4045		106.6052	
S.D.	0.3174	3.3173		0.4035		17.3299		25.4445		49.1918	

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
D102	0	0	0	1	0	0	0	0	0	0	0	0	0
D103	0	0	0	0	0	0	0	1	0	0	0	0	0
D104	0	0	0	0	0	0	0	1	0	0	0	0	0
D105	0	0	0	0	0	0	0	1	0	0	0	0	0
D106	0	1	0	1	0	0	0	0	0	0	0	0	0
D108	0	0	0	0	0	0	0	1	0	0	0	0	0
D109	0	0	0	0	0	0	0	1	0	0	0	0	0
D115	0	0	0	0	0	0	0	1	0	0	0	0	0
D116	0	0	0	0	0	0	0	1	0	0	0	0	0
D118	0	0	0	0	0	0	0	1	0	0	0	0	0
D120	0	0	0	0	0	0	0	1	0	0	0	0	0
D121	0	0	0	0	0	0	0	1	0	0	0	0	0
D122	0	0	0	1	0	0	0	0	0	0	0	0	0
D127	0	1	0	0	0	0	0	1	0	0	0	0	0
D130	0	1	0	0	0	0	0	0	0	1	0	0	0
D132	0	1	0	0	0	0	0	1	0	0	0	0	0
D136	0	0	0	0	0	0	0	0	0	1	0	0	0
D138	0	0	0	0	0	1	0	0	0	0	0	0	0
D139	0	1	0	0	0	0	0	0	0	1	0	0	0
D140	0	0	0	0	0	0	0	1	0	0	0	0	0
D142	0	0	0	0	0	0	0	1	0	0	0	0	0
D143	0	0	0	1	0	0	0	0	0	0	0	0	0
D144	0	0	0	0	0	0	0	1	0	0	0	0	0
D146	1	0	0	0	0	0	0	1	1	0	0	0	0
D147	1	0	0	0	0	0	0	1	1	0	0	0	0
D150	0	1	0	0	0	0	0	1	0	0	0	0	0
D151	0	0	0	0	0	0	0	1	0	0	0	0	0
D152	0	0	0	0	0	0	0	0	0	0	0	1	0
D201	0	0	0	0	0	0	0	1	0	0	0	0	0
D202	0	1	0	0	0	0	0	1	0	0	0	0	0
D203	0	0	0	0	0	0	0	1	0	0	0	0	0
D205	0	0	0	0	0	0	0	1	0	0	0	0	0
D207	0	0	0	0	0	0	0	1	0	0	0	0	0
D208	0	1	0	1	0	0	0	0	0	0	0	0	0
D209	0	0	0	0	0	0	0	1	0	0	0	0	0
D210	0	0	0	0	0	0	0	1	0	0	0	0	0
D211	0	0	0	0	0	0	0	1	0	0	0	0	0
D212	0	0	0	0	0	0	0	1	0	0	0	0	0
D213	0	0	0	0	0	0	0	1	0	0	0	0	0
D214	0	1	0	0	0	0	0	1	0	0	0	0	0
D215	0	1	0	0	0	0	0	1	0	0	0	0	0
D216	0	0	0	0	0	0	0	1	0	0	0	0	0
D219	0	0	0	0	0	0	0	1	0	0	0	0	0
D220	0	0	0	0	0	0	0	1	0	0	0	0	0
D225	0	0	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
D226	0	0	0	0	0	1	0	0	0	0	0	0	0
D227	0	0	0	0	0	0	0	1	0	0	0	0	0
D228	0	1	0	0	0	0	0	1	0	0	0	0	0
D229	0	0	0	0	0	0	0	1	0	0	0	0	0
D231	0	0	0	0	0	0	0	1	0	0	0	0	0
D232	0	1	0	0	0	0	0	1	0	0	0	0	0
D233	0	0	0	0	0	0	0	1	0	0	0	0	0
D235	0	0	0	0	0	0	0	1	0	0	0	0	0
D237	0	0	0	0	0	0	0	1	0	0	0	0	0
D238	1	0	0	0	0	0	0	1	1	0	0	0	0
D239	0	0	0	0	0	1	0	0	0	0	0	0	0
D242	0	0	0	0	0	0	0	1	0	0	0	0	0
D245	0	1	0	0	0	0	0	1	0	0	0	0	0
D249	0	0	0	0	0	0	0	1	0	0	0	0	0
D251	0	0	0	0	0	0	0	1	0	0	0	0	0
D252	0	0	0	0	0	0	0	1	0	0	0	0	0
D253	0	1	0	0	0	0	0	0	0	1	0	0	0
D254	0	0	0	1	0	0	0	0	0	0	0	0	0
D255	0	1	0	0	0	0	0	1	0	0	0	0	0
D302	0	0	0	0	0	0	0	1	0	0	0	0	0
D304	0	0	0	0	0	0	0	1	0	0	0	0	0
D311	0	0	0	0	0	0	0	1	0	0	0	0	0
D316	0	1	0	0	0	0	0	1	0	0	0	0	0
D317	0	1	0	0	0	0	0	1	0	0	0	0	0
D323	0	0	0	0	0	0	0	1	0	0	0	0	0
D326	0	0	0	0	0	0	0	1	0	0	0	0	0
D330	0	0	0	0	0	0	0	1	0	0	0	0	0
D337	1	0	0	0	0	0	0	1	1	0	0	0	0
D401	0	1	0	0	0	0	0	1	0	0	0	0	0
D402	0	0	0	0	0	0	0	0	0	1	0	0	0
D404	0	0	0	0	0	0	0	1	0	0	0	0	0
D405	0	0	0	0	0	0	0	1	0	0	0	0	0
D406	0	0	0	0	0	0	0	1	0	0	0	0	0
D407	0	1	0	0	0	0	0	1	0	0	0	0	0
D409	0	0	0	0	0	0	0	1	0	0	0	0	0
D411	0	0	0	0	0	0	0	1	0	0	0	0	0
D412	0	1	0	0	0	0	0	1	0	0	0	0	0
D413	0	0	0	0	0	0	0	1	0	0	0	0	0
D414	0	1	0	0	0	0	0	1	0	0	0	0	0
D415	0	0	0	0	0	0	0	1	0	0	0	0	0
D416	0	0	0	0	0	0	0	1	0	0	0	0	0
D417	0	0	0	0	0	0	0	1	0	0	0	0	0
D418	0	0	0	1	0	0	0	0	0	0	0	0	0
D419	0	0	0	0	0	0	0	1	0	0	0	0	0
D421	0	0	0	0	0	0	0	1	0	0	0	0	0
D422	0	0	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
D423	0	0	0	0	0	0	0	1	0	0	0	0	0
D424	0	1	0	0	0	0	0	0	0	0	0	1	0
D425	0	0	0	0	0	0	0	1	0	0	0	0	0
D426	0	0	0	0	0	0	0	1	0	0	0	0	0
D428	0	0	0	0	0	0	0	1	0	0	0	0	0
D429	0	0	0	0	0	1	0	0	0	0	0	0	0
D430	1	0	0	0	0	0	0	1	1	0	0	0	0
D431	0	1	0	0	0	0	0	0	0	1	0	0	0
D432	0	0	0	0	0	0	0	1	0	0	0	0	0
D433	0	0	0	0	0	0	0	1	0	0	0	0	0
D434	0	0	0	0	0	0	0	1	0	0	0	0	0
D435	0	0	0	0	0	0	0	1	0	0	0	0	0
D436	1	0	0	0	0	0	0	0	0	1	1	0	0
D437	0	0	0	0	0	0	0	0	0	1	0	0	0
D438	1	0	0	0	0	0	0	1	1	0	0	0	0
D439	0	0	0	0	0	0	0	1	0	0	0	0	0
D440	0	1	0	0	0	0	0	1	0	0	0	0	0
D441	1	0	0	0	0	0	0	1	1	0	0	0	0
D442	0	1	0	0	0	0	0	1	0	0	0	0	0
D443	1	0	0	0	0	0	0	0	0	1	1	0	0
D444	0	1	0	0	0	0	0	1	0	0	0	0	0
D445	0	0	0	0	0	0	0	1	0	0	0	0	0
D446	0	1	0	0	0	0	0	1	0	0	0	0	0
D447	0	0	0	0	0	0	0	1	0	0	0	0	0
D448	0	0	0	0	0	0	0	0	0	1	0	0	0
D449	0	0	0	0	0	0	0	1	0	0	0	0	0
D450	1	1	1	0	0	0	0	1	1	0	0	0	0
D452	1	0	0	0	0	0	0	1	1	0	0	0	0
D453	0	0	0	0	0	1	0	0	0	0	0	0	0
D454	0	1	0	0	0	0	0	1	0	0	0	0	0
D455	1	0	0	0	0	0	0	1	1	0	0	0	0
E103	0	0	0	0	0	0	0	0	0	0	0	1	0
E104	0	1	0	0	0	1	0	0	0	0	0	0	0
E105	1	0	0	0	0	0	0	1	1	0	0	0	0
E107	0	0	0	0	0	0	0	1	0	0	0	0	0
E109	0	0	0	0	0	0	0	1	0	0	0	0	0
E111	0	0	0	0	0	0	0	1	0	0	0	0	0
E113	0	0	0	0	0	0	0	1	0	0	0	0	0
E114	0	0	0	0	0	0	0	1	0	0	0	0	0
E116	0	0	0	0	0	0	0	0	0	0	0	1	0
E117	0	0	0	0	0	0	0	1	0	0	0	0	0
E119	0	0	0	0	0	1	0	0	0	0	0	0	0
E120	0	0	0	0	0	0	0	1	0	0	0	0	0
E121	1	0	0	0	0	0	0	1	1	0	0	0	0
E122	0	1	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
E123	0	0	0	0	0	0	0	0	0	0	0	1	0
E124	0	1	0	0	0	0	0	1	0	0	0	0	0
E125	0	1	0	0	0	0	0	1	0	0	0	0	0
E126	0	0	0	0	0	1	0	0	0	0	0	0	0
E127	0	0	0	0	0	0	0	1	0	0	0	0	0
E129	0	1	0	0	0	0	0	0	0	0	0	1	0
E130	0	0	0	0	0	0	0	1	0	0	0	0	0
E131	1	0	0	0	0	0	0	1	1	0	0	0	0
E132	0	0	0	0	0	0	0	1	0	0	0	0	0
E133	1	0	0	0	0	0	0	1	1	0	0	0	0
E134	0	0	0	0	0	0	0	1	0	0	0	0	0
E135	0	0	0	0	0	0	0	1	0	0	0	0	0
E137	0	0	0	0	0	0	0	1	0	0	0	0	0
E138	0	0	0	0	0	0	0	1	0	0	0	0	0
E139	1	0	0	0	0	0	0	1	1	0	0	0	0
E140	1	1	1	0	0	1	1	0	0	0	0	0	0
E141	0	0	0	0	0	0	0	1	0	0	0	0	0
E143	0	0	0	0	0	0	0	1	0	0	0	0	0
E144	0	1	0	0	0	0	0	1	0	0	0	0	0
E145	0	0	0	0	0	0	0	1	0	0	0	0	0
E146	0	0	0	0	0	0	0	1	0	0	0	0	0
E147	0	0	0	0	0	1	0	0	0	0	0	0	0
E148	0	0	0	0	0	0	0	0	0	1	0	0	0
E149	0	1	0	0	0	0	0	0	0	0	0	1	0
E151	0	0	0	0	0	0	0	1	0	0	0	0	0
E152	1	0	0	0	0	0	0	1	1	0	0	0	0
E154	0	0	0	0	0	0	0	1	0	0	0	0	0
E201	1	1	1	0	0	0	0	0	0	1	1	0	0
E202	0	0	0	0	0	0	0	1	0	0	0	0	0
E203	0	1	0	0	0	0	0	1	0	0	0	0	0
E204	0	0	0	0	0	0	0	1	0	0	0	0	0
E205	1	0	0	0	0	0	0	1	1	0	0	0	0
E206	0	0	0	0	0	0	0	1	0	0	0	0	0
E207	0	0	0	0	0	0	0	0	0	0	0	1	0
E208	1	0	0	0	0	0	0	1	1	0	0	0	0
E209	0	0	0	0	0	0	0	1	0	0	0	0	0
E210	0	0	0	0	0	0	0	1	0	0	0	0	0
E211	0	0	0	0	0	0	0	1	0	0	0	0	0
E212	0	1	0	0	0	0	0	1	0	0	0	0	0
E213	0	0	0	0	0	0	0	1	0	0	0	0	0
E214	0	1	0	0	0	0	0	1	0	0	0	0	0
E215	0	1	0	0	0	0	0	1	0	0	0	0	0
E219	0	0	0	0	0	0	0	1	0	0	0	0	0
E222	0	0	0	0	0	0	0	1	0	0	0	0	0
E223	0	0	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
E224	0	1	0	0	0	0	0	0	0	0	0	1	0
E225	0	1	0	0	0	0	0	1	0	0	0	0	0
E226	0	0	0	0	0	1	0	0	0	0	0	0	0
E227	0	0	0	0	0	0	0	1	0	0	0	0	0
E228	0	0	0	1	0	0	0	0	0	0	0	0	0
E229	0	0	0	0	0	0	0	1	0	0	0	0	0
E230	0	0	0	0	0	0	0	1	0	0	0	0	0
E231	0	0	0	0	0	0	0	1	0	0	0	0	0
E232	0	1	0	0	0	0	0	1	0	0	0	0	0
E233	0	0	0	0	0	0	0	1	0	0	0	0	0
E234	0	0	0	0	0	0	0	1	0	0	0	0	0
E235	0	0	0	0	0	0	0	1	0	0	0	0	0
E236	0	1	0	0	0	0	0	1	0	0	0	0	0
E237	0	0	0	0	0	0	0	1	0	0	0	0	0
E238	0	1	0	0	0	0	0	0	0	1	0	0	0
E239	0	0	0	0	0	0	0	1	0	0	0	0	0
E240	0	1	0	0	0	0	0	1	0	0	0	0	0
E241	0	0	0	0	0	1	0	0	0	0	0	0	0
E243	1	0	0	0	0	0	0	1	1	0	0	0	0
E244	0	0	0	0	0	0	0	1	0	0	0	0	0
E246	0	1	0	0	0	0	0	1	0	0	0	0	0
E247	0	0	0	0	0	1	0	0	0	0	0	0	0
E248	0	0	0	0	0	0	0	1	0	0	0	0	0
E249	0	0	0	0	0	0	0	1	0	0	0	0	0
E250	0	1	0	0	0	1	0	0	0	0	0	0	0
E251	0	0	0	0	0	1	0	0	0	0	0	0	0
E252	0	0	0	0	0	0	0	1	0	0	0	0	0
E253	0	0	0	0	0	0	0	1	0	0	0	0	0
E254	0	0	0	0	0	0	0	1	0	0	0	0	0
E255	0	0	0	1	0	0	0	0	0	0	0	0	0
E301	0	0	0	0	0	0	0	0	0	1	0	0	0
E302	0	0	0	0	0	0	0	1	0	0	0	0	0
E303	0	1	0	0	0	0	0	1	0	0	0	0	0
E304	0	0	0	0	0	0	0	0	0	1	0	0	0
E305	1	0	0	0	0	0	0	1	1	0	0	0	0
E307	0	1	0	0	0	0	0	1	0	0	0	0	0
E308	0	0	0	0	0	0	0	1	0	0	0	0	0
E309	0	0	0	0	0	0	0	1	0	0	0	0	0
E310	0	1	0	0	0	0	0	1	0	0	0	0	0
E312	0	0	0	0	0	0	0	1	0	0	0	0	0
E313	0	0	0	0	0	0	0	1	0	0	0	0	0
E314	0	0	0	0	0	0	0	1	0	0	0	0	0
E315	0	0	0	0	0	1	0	0	0	0	0	0	0
E316	0	0	0	0	0	0	0	1	0	0	0	0	0
E317	0	0	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
E318	0	1	0	0	0	0	0	1	0	0	0	0	0
E319	0	0	0	0	0	0	0	1	0	0	0	0	0
E320	1	0	0	0	0	0	0	1	1	0	0	0	0
E321	0	0	0	0	0	0	0	1	0	0	0	0	0
E322	0	0	0	0	0	0	0	1	0	0	0	0	0
E323	0	0	0	0	0	0	0	0	0	1	0	0	0
E324	0	0	0	0	0	0	0	1	0	0	0	0	0
E325	0	0	0	0	0	0	0	1	0	0	0	0	0
E327	0	1	0	0	0	0	0	1	0	0	0	0	0
E328	1	0	0	0	0	0	0	1	1	0	0	0	0
E329	0	0	0	0	0	0	0	1	0	0	0	0	0
E330	0	1	0	0	0	0	0	1	0	0	0	0	0
E331	1	0	0	0	0	0	0	1	1	0	0	0	0
E334	0	0	0	0	0	0	0	1	0	0	0	0	0
E335	0	1	0	0	0	0	0	1	0	0	0	0	0
E336	1	0	0	0	0	1	1	0	0	0	0	0	0
E337	1	1	1	0	0	0	0	0	0	1	1	0	0
E338	0	0	0	0	0	1	0	0	0	0	0	0	0
E339	1	0	0	0	0	0	0	1	1	0	0	0	0
E340	1	0	0	0	0	0	0	0	0	1	1	0	0
E341	0	0	0	0	0	1	0	0	0	0	0	0	0
E342	0	0	0	0	0	0	0	1	0	0	0	0	0
E343	0	0	0	0	0	0	0	1	0	0	0	0	0
E344	0	0	0	0	0	0	0	0	0	1	0	0	0
E345	0	0	0	0	0	0	0	1	0	0	0	0	0
E346	0	0	0	0	0	0	0	1	0	0	0	0	0
E347	0	0	0	0	0	0	0	0	0	1	0	0	0
E348	0	0	0	0	0	0	0	1	0	0	0	0	0
E349	0	0	0	0	0	0	0	1	0	0	0	0	0
E350	1	0	0	0	0	0	0	1	1	0	0	0	0
E351	0	0	0	0	0	0	0	1	0	0	0	0	0
E352	0	0	0	0	0	1	0	0	0	0	0	0	0
E353	1	1	1	0	0	0	0	1	1	0	0	0	0
E354	0	0	0	0	0	0	0	1	0	0	0	0	0
E355	1	0	0	0	0	0	0	1	1	0	0	0	0
E356	0	1	0	0	0	0	0	1	0	0	0	0	0
E401	0	1	0	0	0	0	0	1	0	0	0	0	0
E402	0	0	0	0	0	0	0	1	0	0	0	0	0
E403	0	1	0	0	0	0	0	1	0	0	0	0	0
E404	0	0	0	0	0	0	0	1	0	0	0	0	0
E406	0	0	0	0	0	0	0	1	0	0	0	0	0
E407	0	0	0	0	0	0	0	1	0	0	0	0	0
E408	0	1	0	0	0	0	0	1	0	0	0	0	0
E409	0	0	0	0	0	0	0	1	0	0	0	0	0
E410	0	0	0	0	0	0	0	1	0	0	0	0	0

RN	Y(INJ)	X(WGHT)	X*Y	X(ASI)	X*Y	X(BLA)	X*Y	X(CAU)	X*Y	X(HIS)	X*Y	X(OTH)	X*Y
E411	0	0	0	0	0	0	0	1	0	0	0	0	0
E412	0	1	0	0	0	0	0	1	0	0	0	0	0
E413	0	0	0	0	0	0	0	1	0	0	0	0	0
E414	0	0	0	0	0	0	0	1	0	0	0	0	0
E415	0	0	0	0	0	0	0	1	0	0	0	0	0
E416	0	0	0	0	0	0	0	1	0	0	0	0	0
E417	0	0	0	0	0	0	0	0	0	1	0	0	0
E418	1	0	0	0	0	0	0	0	0	1	1	0	0
E419	0	0	0	0	0	0	0	1	0	0	0	0	0
E421	0	1	0	0	0	0	0	1	0	0	0	0	0
E424	0	0	0	0	0	0	0	1	0	0	0	0	0
E426	0	0	0	0	0	0	0	1	0	0	0	0	0
E427	0	0	0	0	0	0	0	0	0	1	0	0	0
E428	0	0	0	0	0	0	0	1	0	0	0	0	0
E429	0	0	0	1	0	0	0	0	0	0	0	0	0
E431	0	0	0	1	0	0	0	0	0	0	0	0	0
E432	0	0	0	0	0	1	0	0	0	0	0	0	0
E433	0	0	0	0	0	0	0	1	0	0	0	0	0
E434	0	0	0	0	0	0	0	1	0	0	0	0	0
E435	0	0	0	0	0	1	0	0	0	0	0	0	0
E436	0	0	0	0	0	0	0	1	0	0	0	0	0
E438	0	0	0	0	0	0	0	1	0	0	0	0	0
E439	0	0	0	0	0	0	0	1	0	0	0	0	0
E440	0	0	0	0	0	0	0	1	0	0	0	0	0
E441	0	1	0	0	0	0	0	1	0	0	0	0	0
E442	0	0	0	0	0	0	0	1	0	0	0	0	0
E444	0	0	0	0	0	0	0	1	0	0	0	0	0
E445	0	0	0	0	0	0	0	1	0	0	0	0	0
E446	0	1	0	0	0	1	0	0	0	0	0	0	0
E447	0	1	0	0	0	0	0	1	0	0	0	0	0
E448	0	0	0	0	0	0	0	1	0	0	0	0	0
E449	0	0	0	0	0	0	0	1	0	0	0	0	0
E450	0	1	0	0	0	0	0	1	0	0	0	0	0
E451	0	0	0	0	0	0	0	1	0	0	0	0	0
E452	0	0	0	0	0	0	0	1	0	0	0	0	0
E454	0	1	0	0	0	0	0	1	0	0	0	0	0
E455	0	0	0	1	0	0	0	0	0	0	0	0	0
E456	0	1	0	0	0	0	0	1	0	0	0	0	0
Sums:	35	71	5	12	0	23	2	242	27	23	6	9	0
Mean:	0.1133	0.2298		0.0388		0.0744		0.7832		0.0744		0.0291	
S.D.	0.3174	0.4214		0.1935		0.2629		0.4128		0.2629		0.1684	

Appendix 15. SPSS Descriptive Statistics

Number of valid observations (listwise) = 309

Variable AGE Trainee Age

Mean	20.6375	S.E. Mean	.19
Std Dev	3.3173	Variance	11.005
Minimum	17	Maximum	35
Sum	6377		

Valid observations = 309 Missing observations = 0

Number of valid observations (listwise) = 309

Variable HX Previous Injury History

Mean	.2039	S.E. Mean	.0230
Std Dev	.4035	Variance	.163
Minimum	0	Maximum	1
Sum	63		

Valid observations = 309 Missing observations = 0

Number of valid observations (listwise) = 309

Variable PU PT Test - Push Up Score

Mean	42.0550	S.E. Mean	.99
Std Dev	17.3299	Variance	300.325
Minimum	0	Maximum	92
Sum	12995		

Valid observations = 309 Missing observations = 0

Number of valid observations (listwise) = 309

Variable RUN PT Test - Run Score

Mean	28.4045	S.E. Mean	1.45
Std Dev	25.4445	Variance	647.423
Minimum	0	Maximum	100
Sum	8777		

Valid observations = 309 Missing observations = 0

Number of valid observations (listwise) = 309

Variable SCORE PT Test – Cumulative Score

```
Mean       106.6052       S.E. Mean          2.80
Std Dev     49.1918       Variance        2419.831
Minimum      0            Maximum          256
Sum        32941

Valid observations = 309 Missing observations = 0
```

```
Number of valid observations (listwise) = 309

Variable  WGHT Overweight During Initial Entrance Physical

Mean       .2298          S.E. Mean        .0240
Std Dev    .4214          Variance         .178
Minimum    0              Maximum         1
Sum        71

Valid observations = 309 Missing observations = 0
```

```
Number of valid observations (listwise) = 309

Variable  ASI  Race (Asian)

Mean       .0388          S.E. Mean        .0110
Std Dev    .1935          Variance         .0375
Mimimum    0              Maximum         1
Sum        12

Valid observations = 309 Missing observations = 0
```

```
Number of valid observations (listwise) = 309

Variable  BLA  Race (Black)

Mean       .0744          S.E. Mean        .0150
Std Dev    .2629          Variance         .0691
Minimum    0              Maximum         1
Sum        23

Valid observations = 309 Missing observations = 0
```

```
Number of valid observations (listwise) = 309

Variable  CAU  Race (Caucasian)

Mean       .7832          S.E. Mean        .0235
Std Dev    .4128          Variance         .170
Minimum    0              Maximum         1
Sum        242

Valid observations = 309 Missing observations = 0
```

```
Number of valid observations (listwise) = 309
```

Variable HIS Race (Hispanic)

Mean	.0744	S.E. Mean	.0150
Std Dev	.2629	Variance	.0691
Minimum	0	Maximum	1
Sum	27		

Valid observations = 309 Missing observations = 0

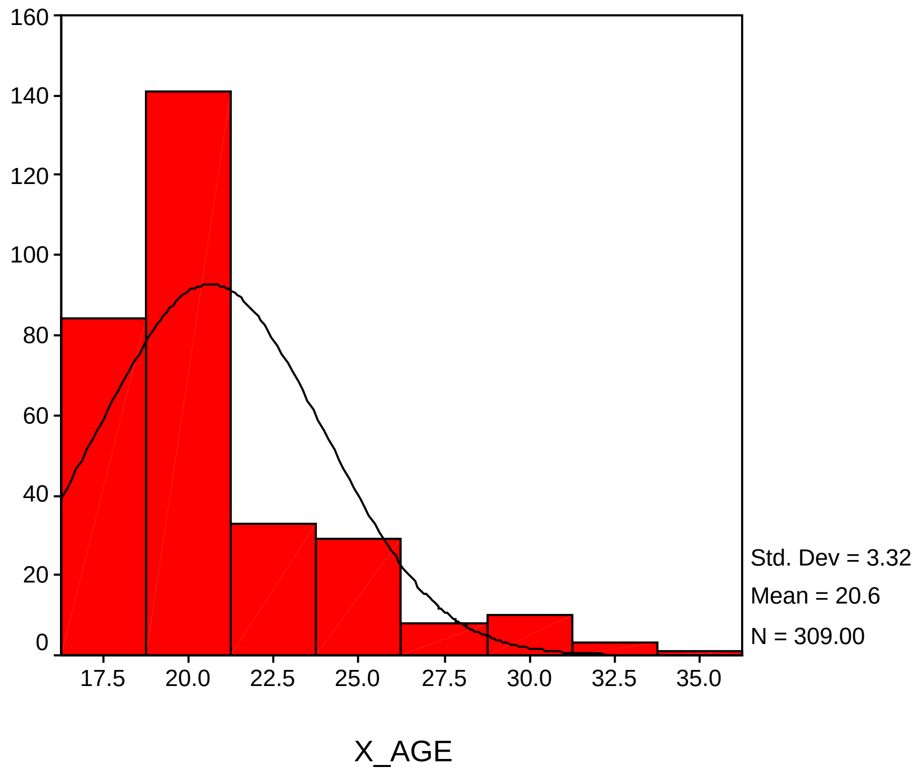
Number of valid observations (listwise) = 309

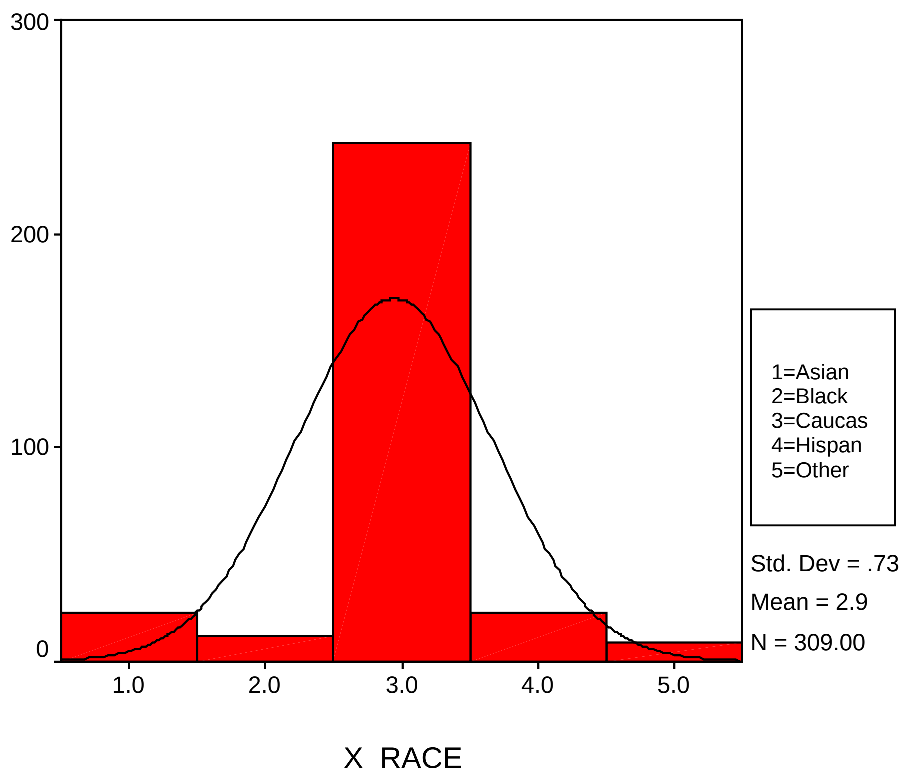
Variable OTH Race (Other)

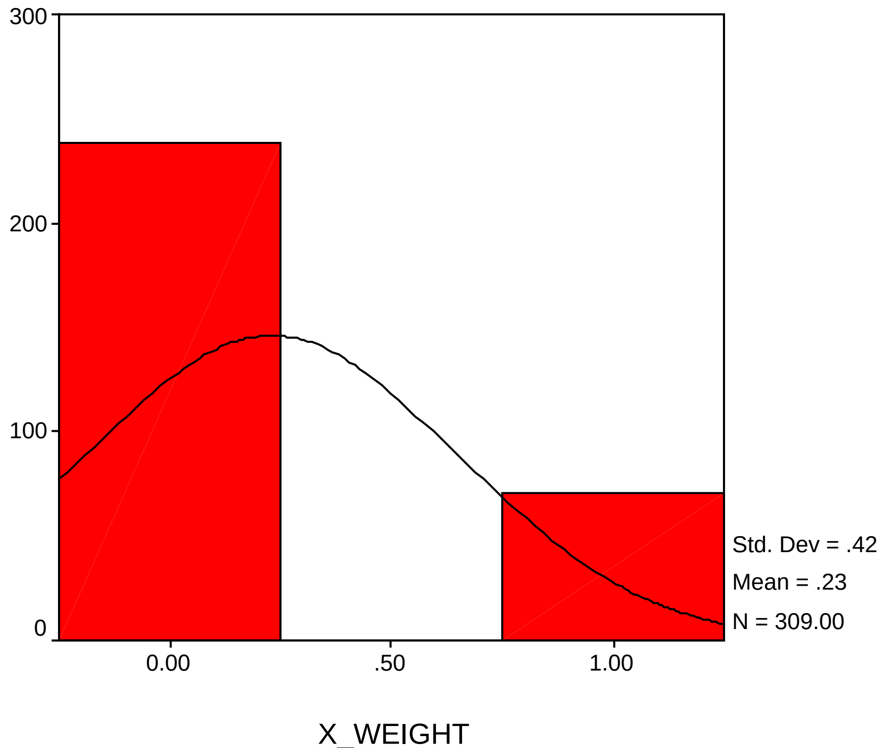
Mean	.0291	S.E. Mean	.0958
Std Dev	.1684	Variance	.0284
Minimum	0	Maximum	1
Sum	9		

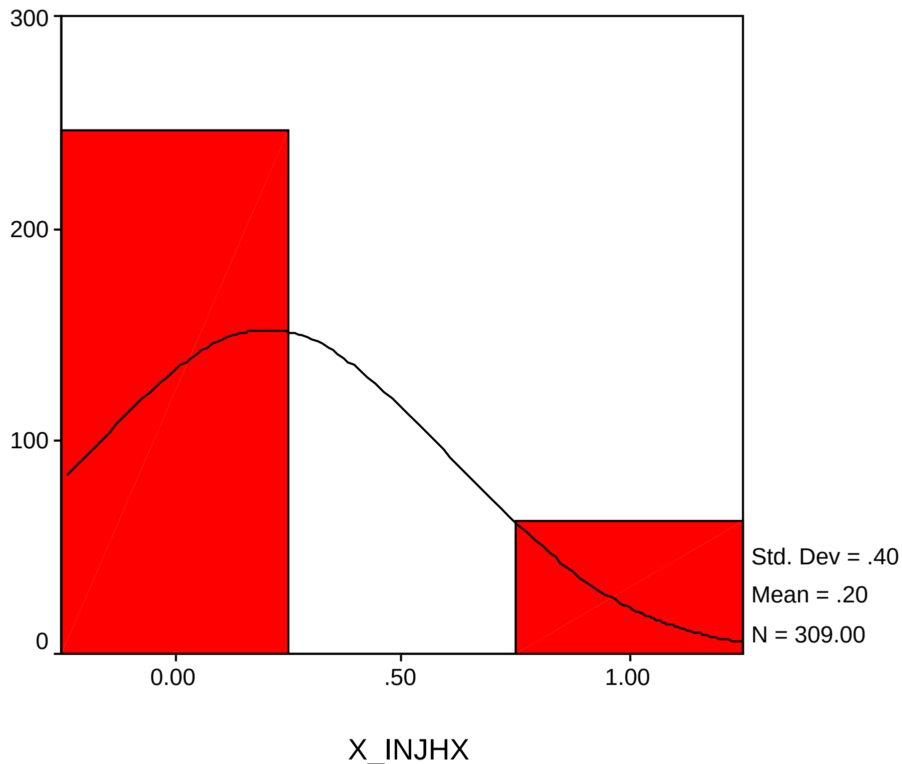
Valid observations = 309 Missing observations = 0

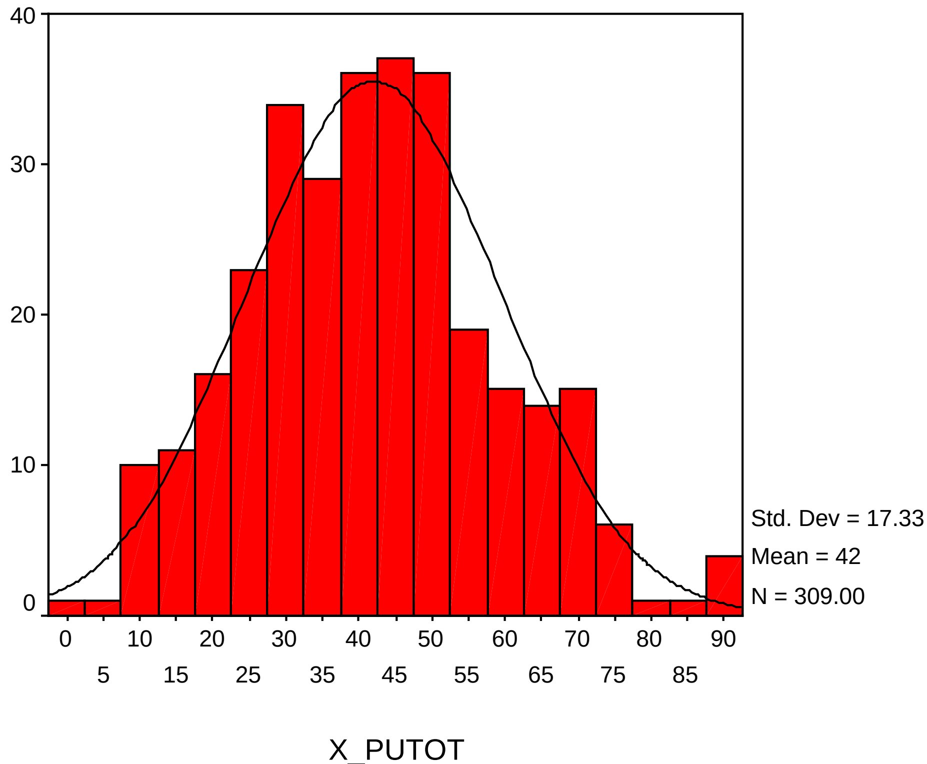
Appendix 16. SPSS Frequency Distributions (Histograms)

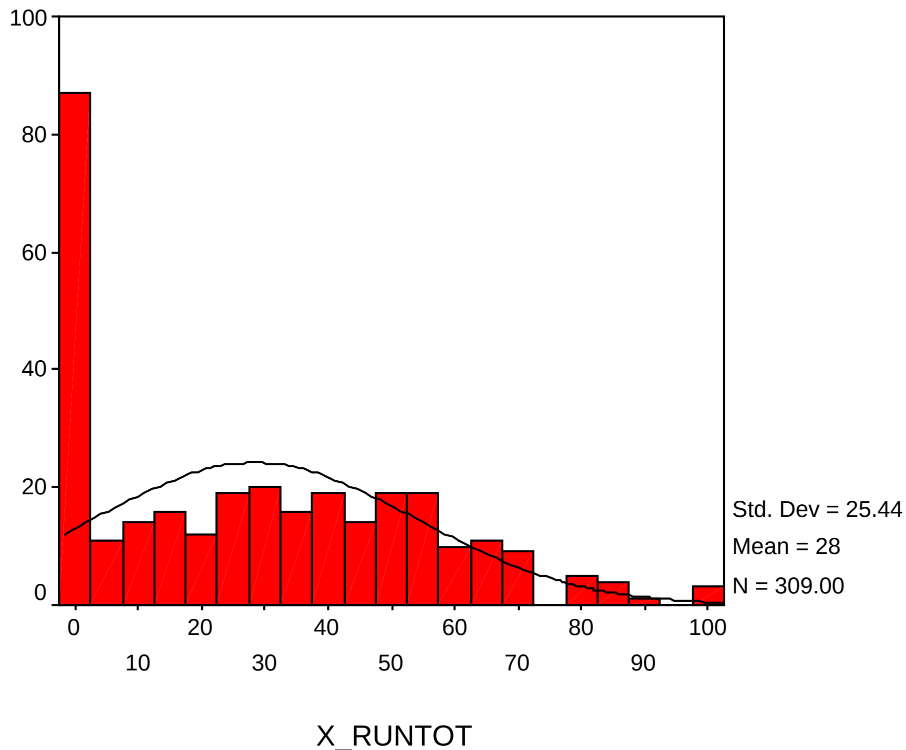


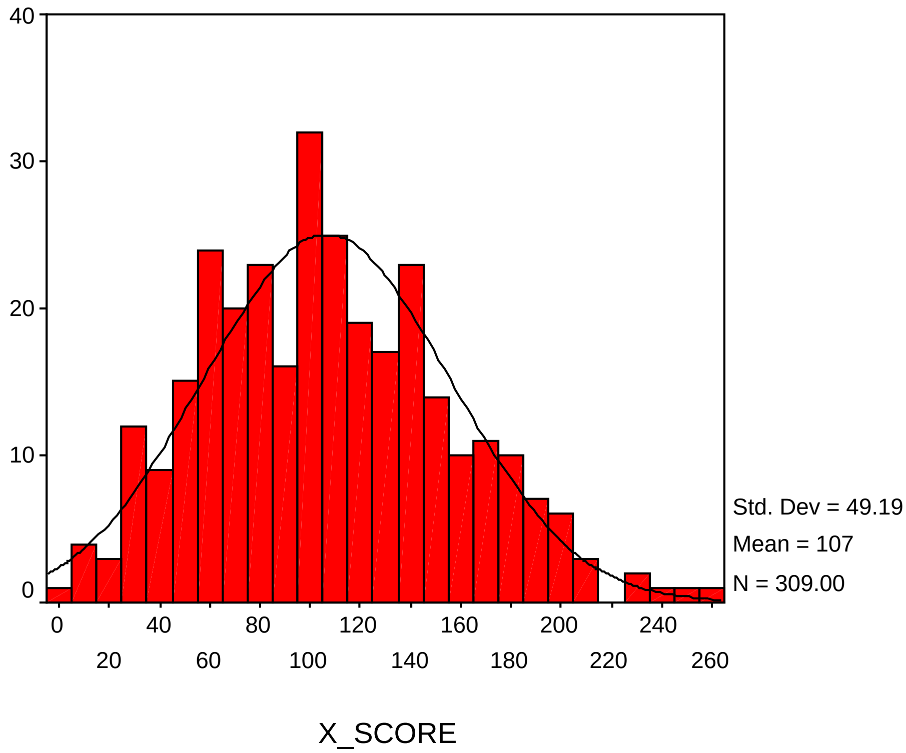



300
200
100
0
0.00
.50
1.00
Std. Dev = .42
Mean = .23
N = 309.00
X_WEIGHT


300
200
100
0
0.00
.50
1.00
Std. Dev = .40
Mean = .20
N = 309.00
X_INJHX


40
30
20
10
0
0 10 20 30 40 50 60 70 80 90
5 15 25 35 45 55 65 75 85
Std. Dev = 17.33
Mean = 42
N = 309.00
X_PUTOT


100
80
60
40
20
0
0 20 40 60 80 100
10 30 50 70 90
Std. Dev = 25.44
Mean = 28
N = 309.00
X_RUNTOT



40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
Std. Dev = 49.19
Mean = 107
N = 309.00
X_SCORE

Appendix 17. SPSS Correlation Matrix

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
AGE	20.6375	3.3173	Trainee Age

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	AGE
TRNGINJ	1.000	.014 .800
AGE	.014 .800	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
HX	.2039	.4035	Previous Injury History

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	HX
TRNGINJ	1.000	-.029 .614
HX	-.029 .614	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
PUTOT	42.0550	17.3299	PT Test – PU Score

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	PUTOT
TRNGINJ	1.000	-.039
		.489
PUTOT	-.039	1.000
	.489	

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
RUNTOT	28.4045	25.4445	PT Test - Run Score

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	RUNTOT
TRNGINJ	1.000	-.057
		.317
RUNTOT	-.057	1.000
	.317	

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
SCORE	106.6052	49.1918	PT Test-Cumulative Score

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	SCORE
TRNGINJ	1.000	-.063
		.268
SCORE	-.063	1.000
	.268	

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
WEIGHT	.2298	.4214	Overweight at Init Phys

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	WEIGHT
TRNGINJ	1.000	-.074 .195
WEIGHT	-.074 .195	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
ASI	.0388	.1935	Race (Asian)

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	ASI
TRNGINJ	1.000	-.072 .208
ASI	-.072 .208	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
BLA	.0744	.2629	Race (Black)

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	BLA
TRNGINJ	1.000	-.024 .680
BLA	-.024 .680	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
CAU	.7832	.4128	Race (Caucasian)

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	CAU
TRNGINJ	1.000	-.010 .858
CAU	-.010 .858	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
HIS	.0744	.2629	Race (Hispanic)

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	HIS
TRNGINJ	1.000	.132 .020
HIS	.132 .020	1.000

Listwise Deletion of Missing Data

	Mean	Std Dev	Label
TRNGINJ	.1138	.3174	Injury Presentations
OTHER	.0291	.1684	Race (Other)

N of Cases = 309

Correlation, 2-tailed Sig:

	TRNGINJ	OTHER
TRNGINJ	1.000	-.062 .278

OTHER	-.062 .278	1.000

Appendix 18. SPSS Regression Analyses

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): AGE Trainee Age

Multiple R	.014
R Square	.000
Adjusted R Square	-.003
Standard Error	.32

Analysis of Variance

	df	Sum of Squares	Mean Square
Regression	1	.0065	.0065
Residual	307	31.029	.101

F = .064 Signif F = .800

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.0847	.114	
AGE	.0014	.005	.014

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): HX Previous Injury History

Multiple R	.029
R Square	.001
Adjusted R Square	-.002
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.256	.613
Continuity Correlation	1	.080	.777
Likelihood Ratio	1	.266	.606

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.0257	.020	
HX	-.0227	.045	-.029

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ		Injury Presentations	
Predictors (Constant): PUTOT		PT Test - Push Up Score	

Multiple R	.039
R Square	.002
Adjusted R Square	-.002
Standard Error	.32

Analysis of Variance

	df	Sum of Squares	Mean Square
Regression	1	.0484	.0484
Residual	307	30.987	.101

F = .480 Signif F = .489

Variables in the Equation

Variable	B	SE B	Beta
(Constant)	.144	.048	
PUTOT	-.0007	.001	-.039

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ		Injury Presentations	
Predictors (Constant): RUNTOT		PT Test - Run Score	

Multiple R	.057
R Square	.003
Adjusted R Square	.000
Standard Error	.32

Analysis of Variance

	df	Sum of Squares	Mean Square
Regression	1	.101	.101
Residual	307	30.934	.101

F = 1.006 Signif F = .317

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.134	.027	
RUNTOT	-.0007	.001	-.057

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ		Injury Presentations	
Predictors (Constant): SCORE		PT Test Cumulative Score	

Multiple R	.064
R Square	.004
Adjusted R Square	.001
Standard Error	.32

Analysis of Variance

	df	Sum of Square	Mean Square
Regression	1	.124	.124
Residual	307	30.911	.101

F = 1.233 Signif F = .268

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.157	.043	
SCORE	-.0004	.000	-.63

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): WGHT Overweight at Init Phys

Multiple R	.074
R Square	.005
Adjusted R Square	.002
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	1.685	.194
Continuity Correlation	1	1.177	.278
Likelihood Ratio	1	1.851	.174

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.126	.021	
WGHT	-.0556	.043	-.074

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): ASI Race (Asian)

Multiple R	.072
R Square	.005

Adjusted R Square	.002
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	1.595	.207
Continuity Correlation	1	.637	.425
Likelihood Ratio	1	2.946	.086

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.118	.018	
ASI	-.118	.093	-.072

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): BLA Race (Black)

Multiple R	.024
R Square	.001
Adjusted R Square	-.003
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.171	.679
Continuity Correlation	1	.005	.943
Likelihood Ratio	1	.183	.668

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.115	.019	
BLA	-.0284	.069	-.024

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ Injury Presentations
Predictors (Constant): CAU Race (Caucasian)

Multiple R	.010
R Square	.000
Adjusted R Square	-.003
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	.032	.858
Continuity Correlation	1	.000	1.000
Likelihood Ratio	1	.032	.859

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.119	.039	
CAU	-.0078	.044	-.010

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ   Injury Presentations
Predictors (Constant): HIS   Race (Hispanic)

Multiple R	.132
R Square	.017
Adjusted R Square	.014
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	5.390	.020
Continuity Correlation	1	3.919	.048
Likelihood Ratio	1	4.235	.040

Variables in Equation

Variable	B	SE B	Beta
(Constant)	.101	.019	
HIS	.159	.068	.132

Dependent Variable: TRNGINJ

Dependent Variable: TRNGINJ   Injury Presentations
Predictors (Constant): OTH   Race (Other)

Multiple R	.062
R Square	.004
Adjusted R Square	.001
Standard Error	.32

Chi-Square Tests

	df	Value	Asymp Sig (2-sided)
Pearson Chi-Square	1	1.184	.277
Continuity Correlation	1	.307	.579

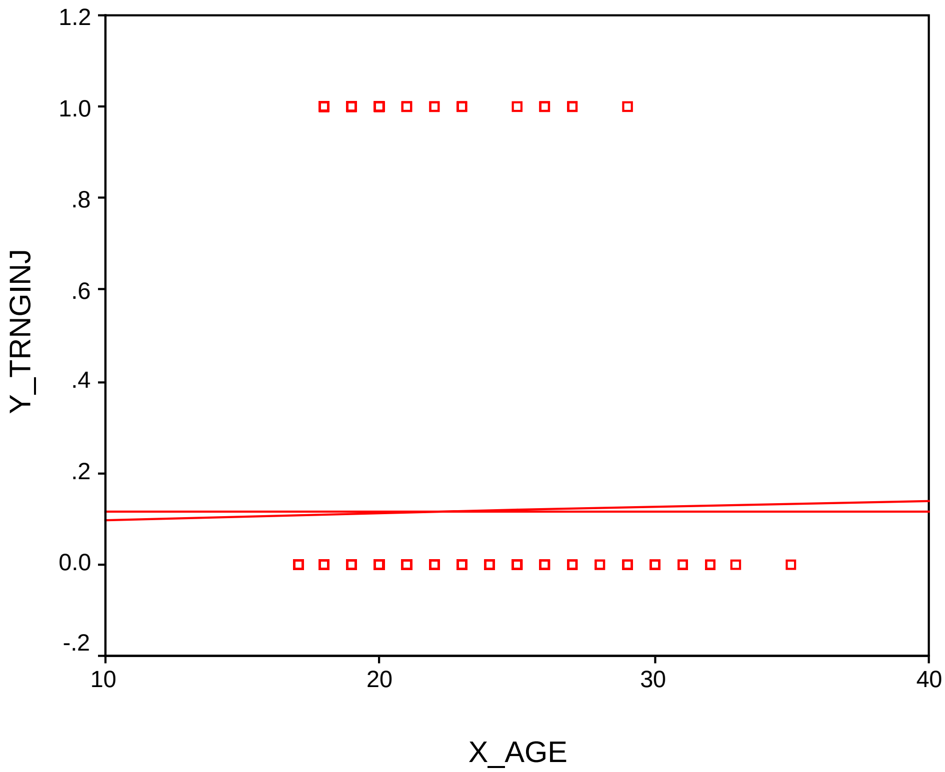
Likelihood Ratio	1	2.198	.138

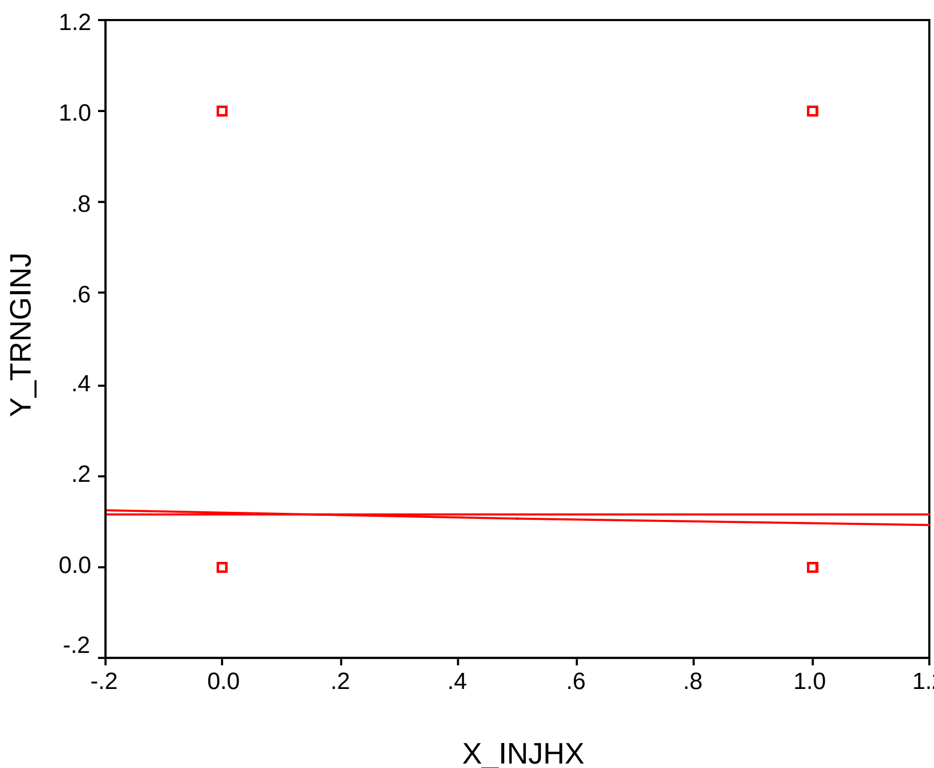
Variables in Equation

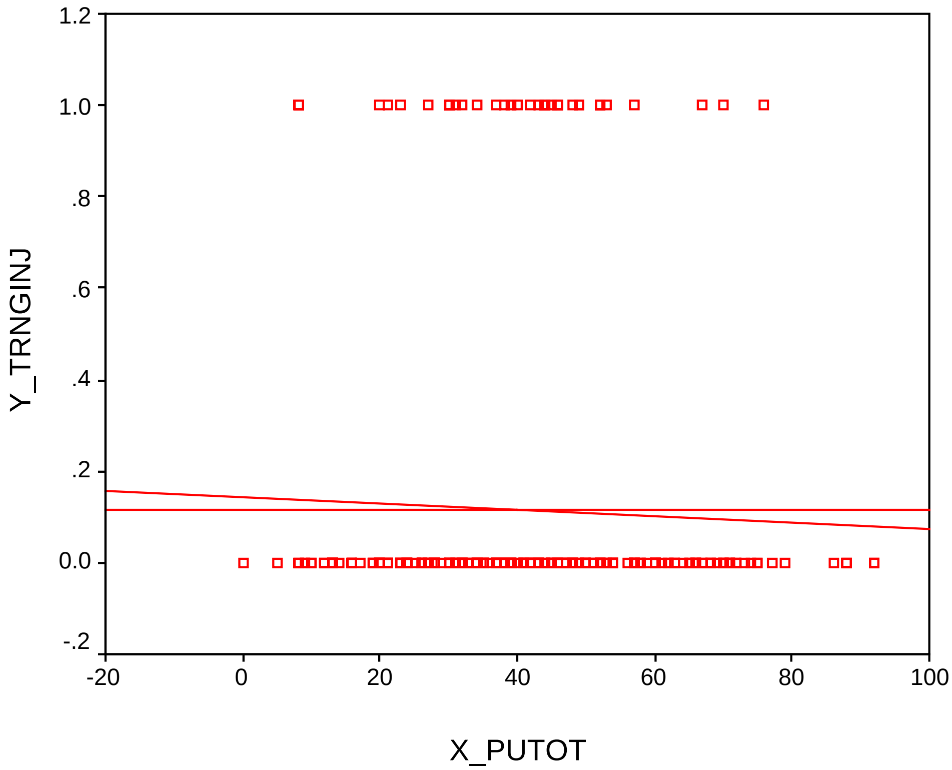
Variable	B	SE B	Beta
(Constant)	.117	.018	
WGHT	-.117	.107	-.062

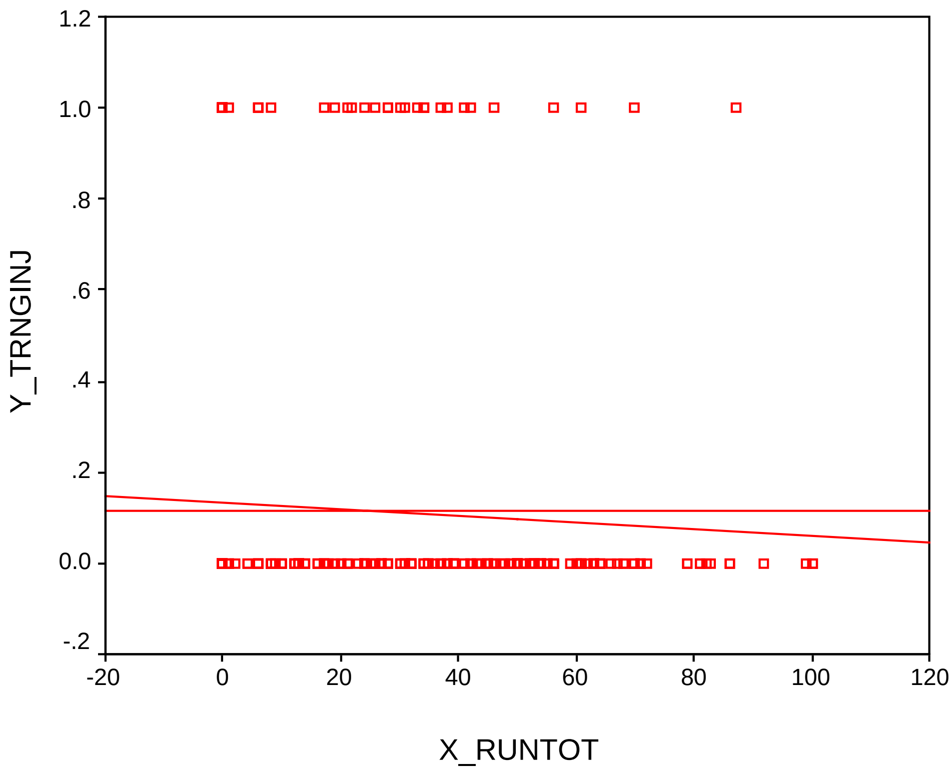
Dependent Variable: TRNGINJ

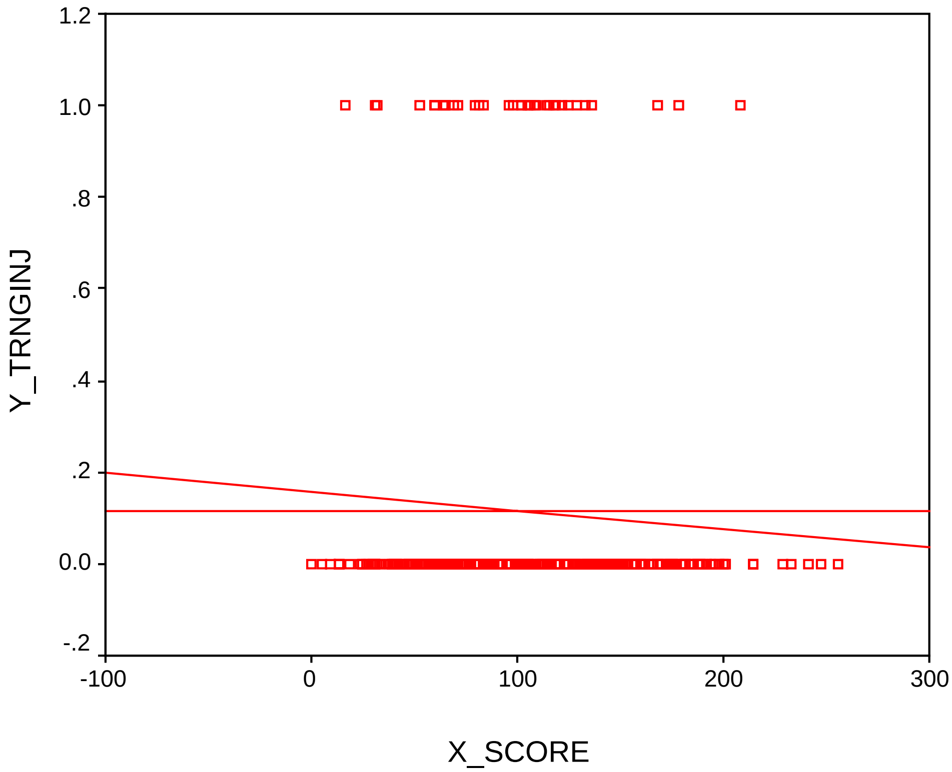
Appendix 19. SPSS Graph – Least-Squares Regression



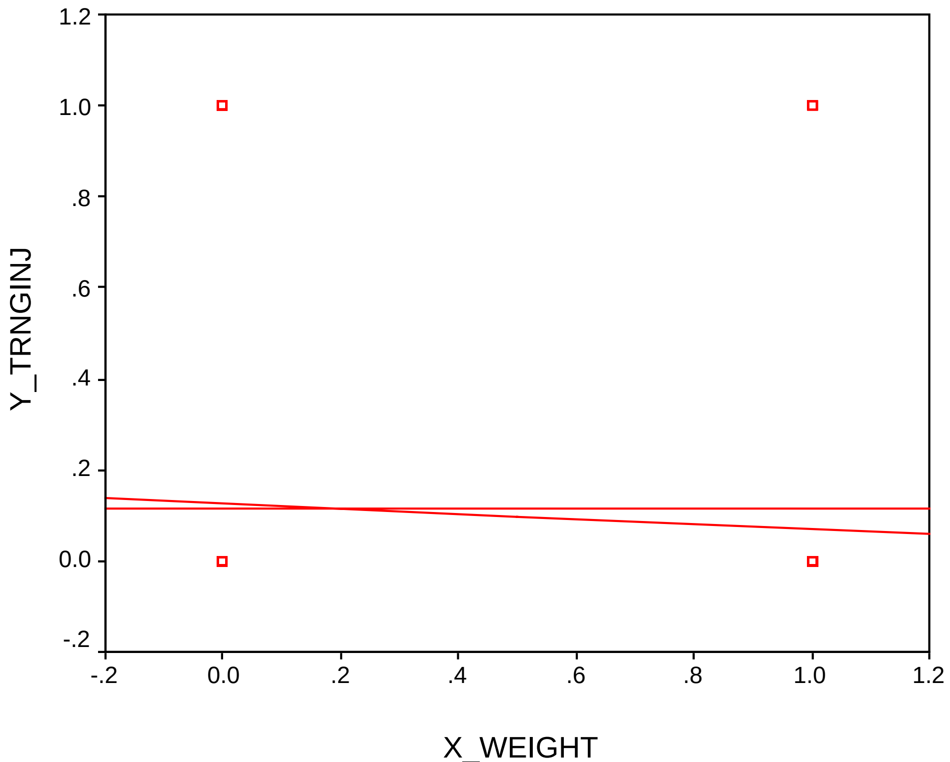



1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-20
0
20
40
60
80
100
X_PUTOT

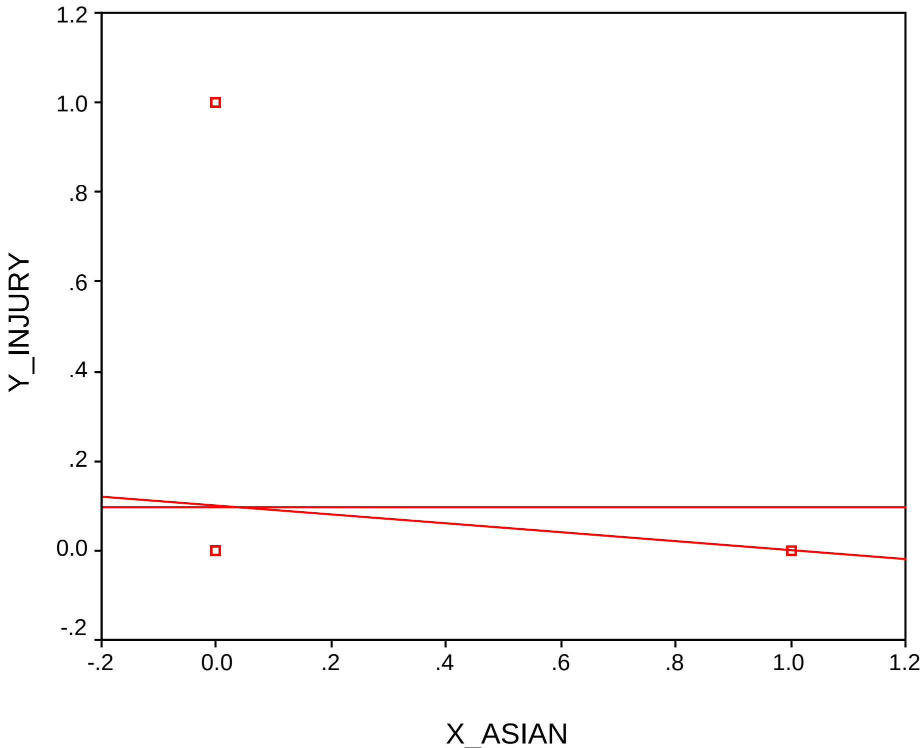

1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-20
0
20
40
60
80
100
120
X_RUNTOT

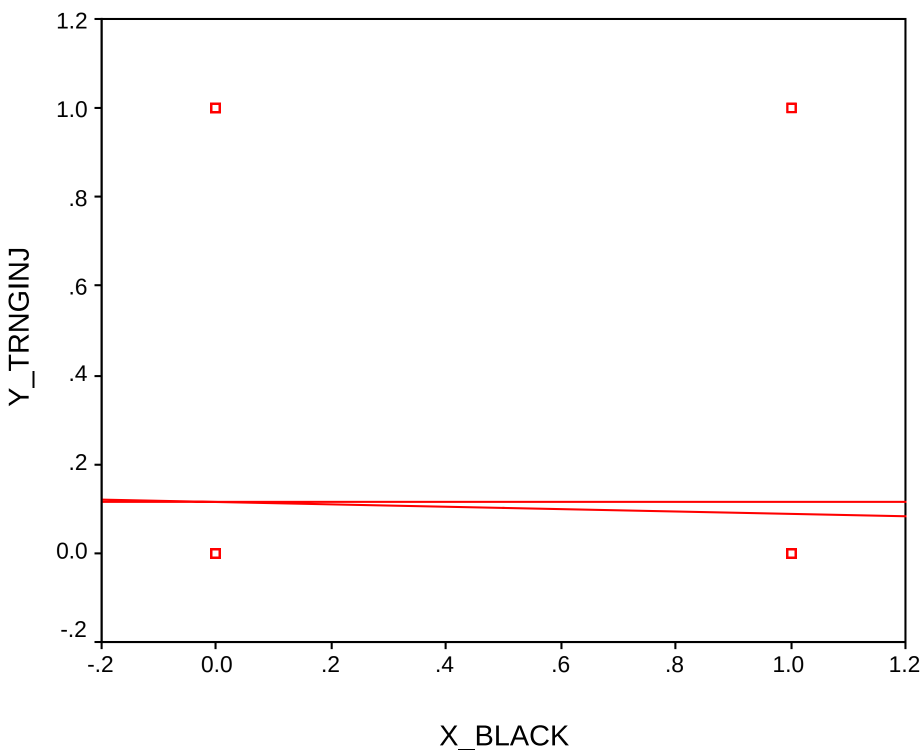


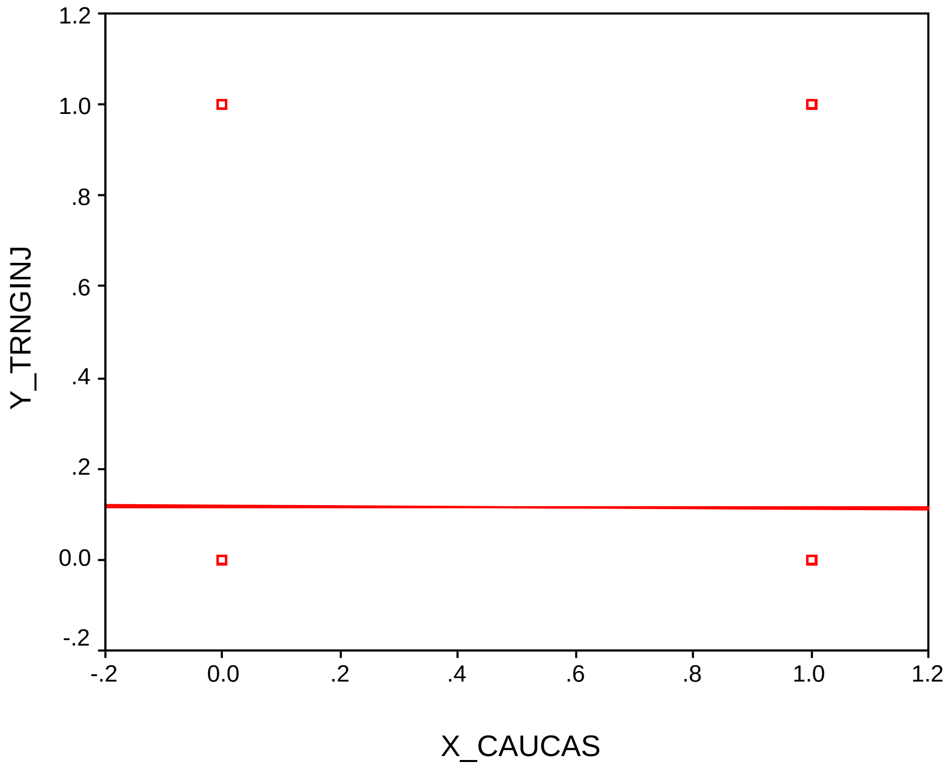
1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-100
0
100
200
300
X_SCORE

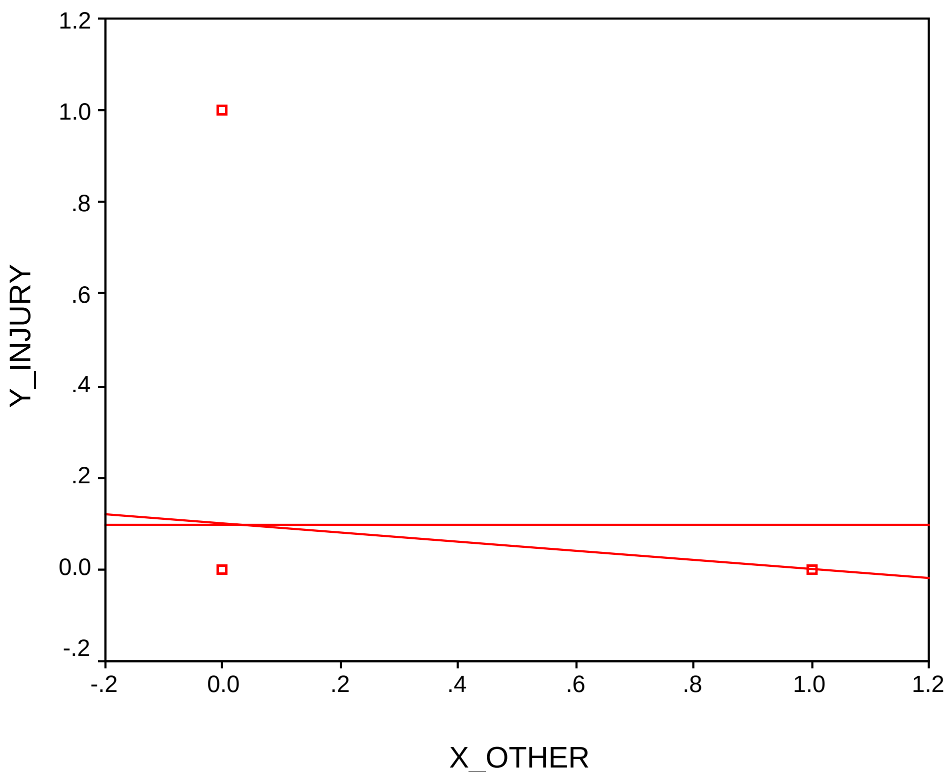


1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_WEIGHT

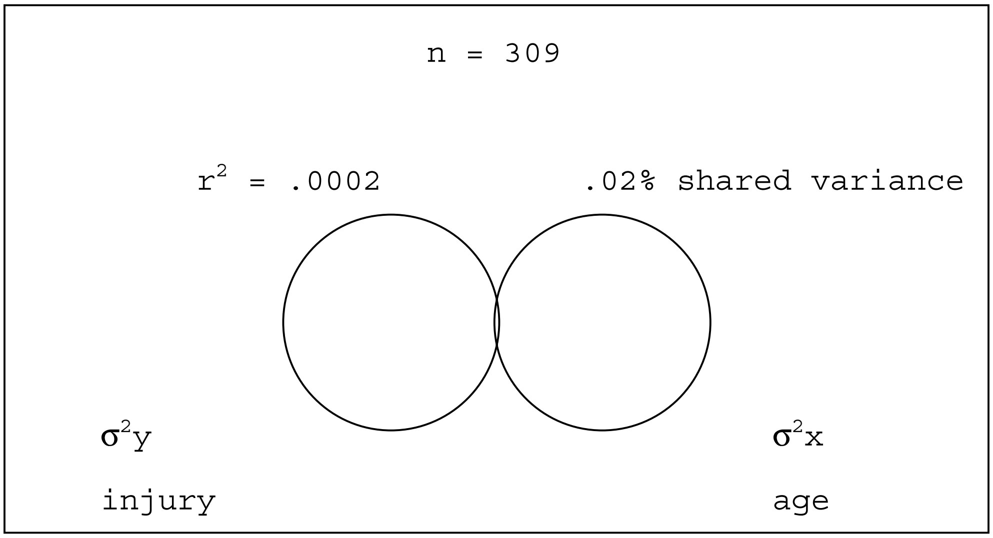

1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_INJURY
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_ASIAN


1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_BLACK

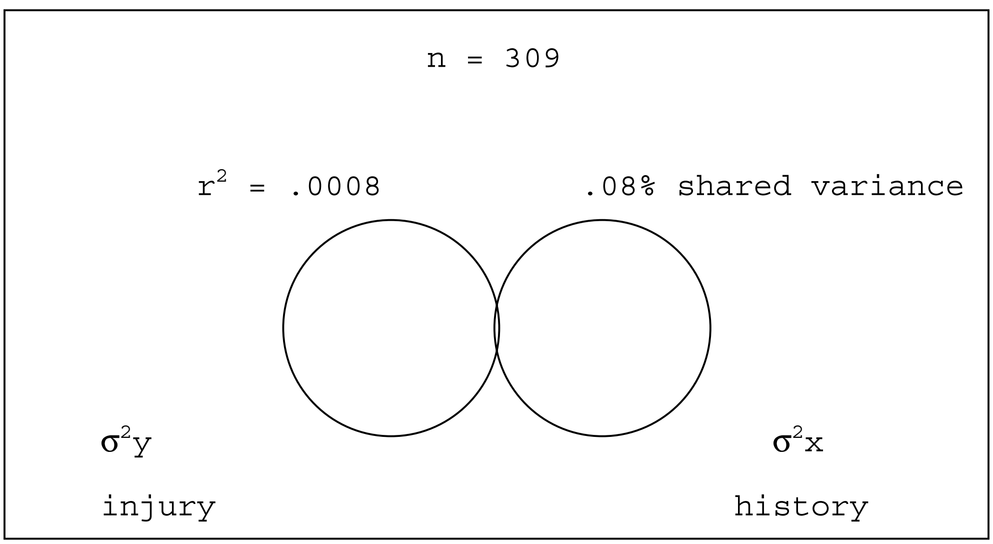

1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_TRNGINJ
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_CAUCAS


1.2
1.0
.8
.6
.4
.2
0.0
-.2
Y_INJURY
-.2
0.0
.2
.4
.6
.8
1.0
1.2
X_OTHER

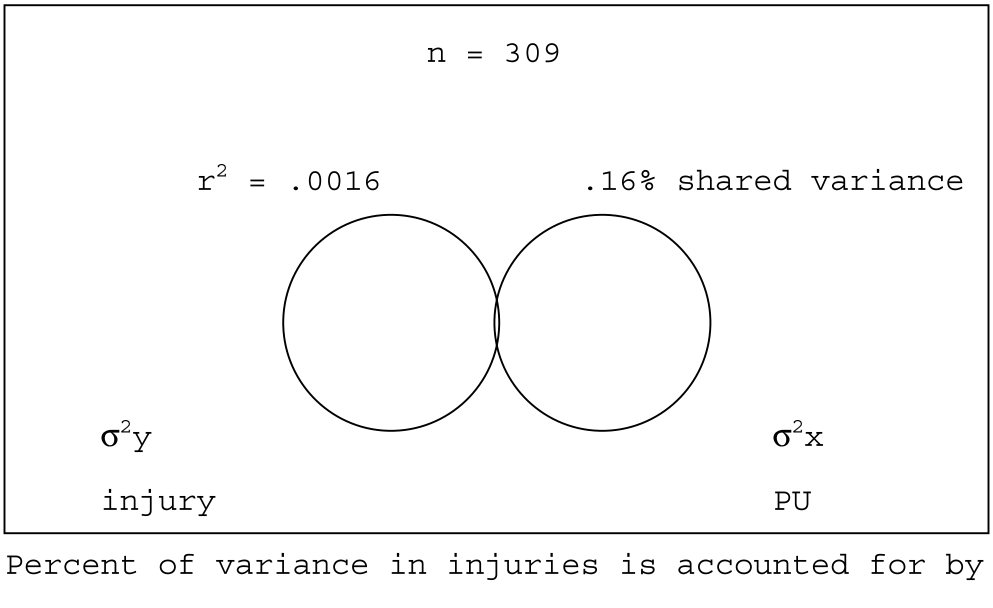
Appendix 20. Venn Diagrams – Correlation of Risk Factors



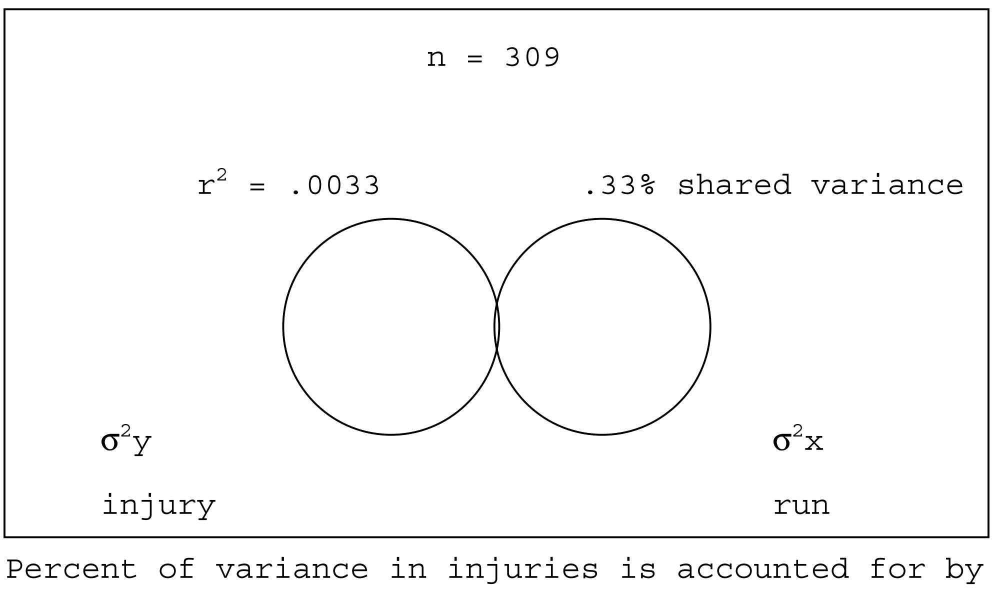
Percent of variance in injuries is accounted for by the variance of age



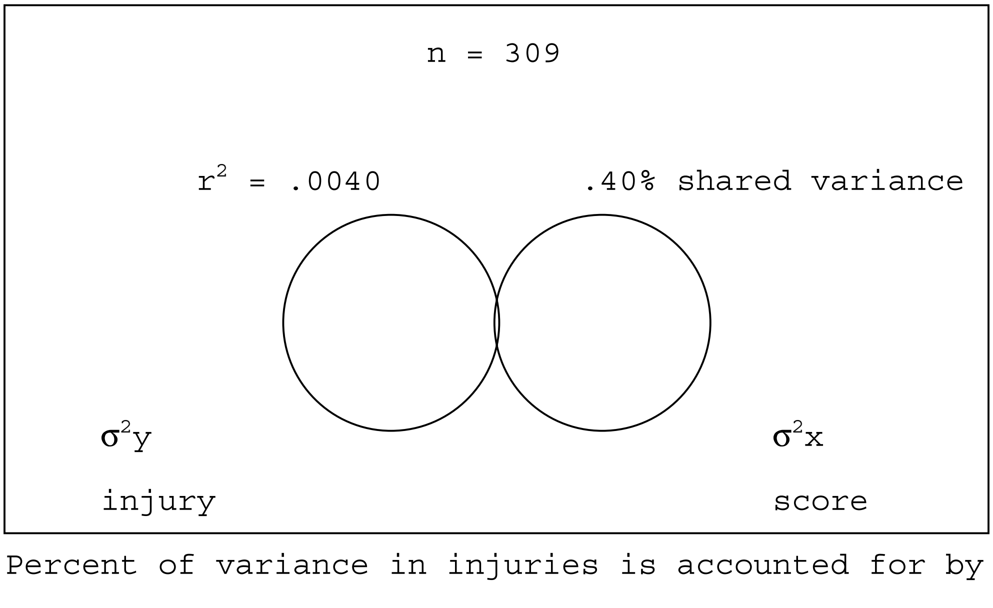
Percent of variance in injuries is accounted for by the variance of previous injury history



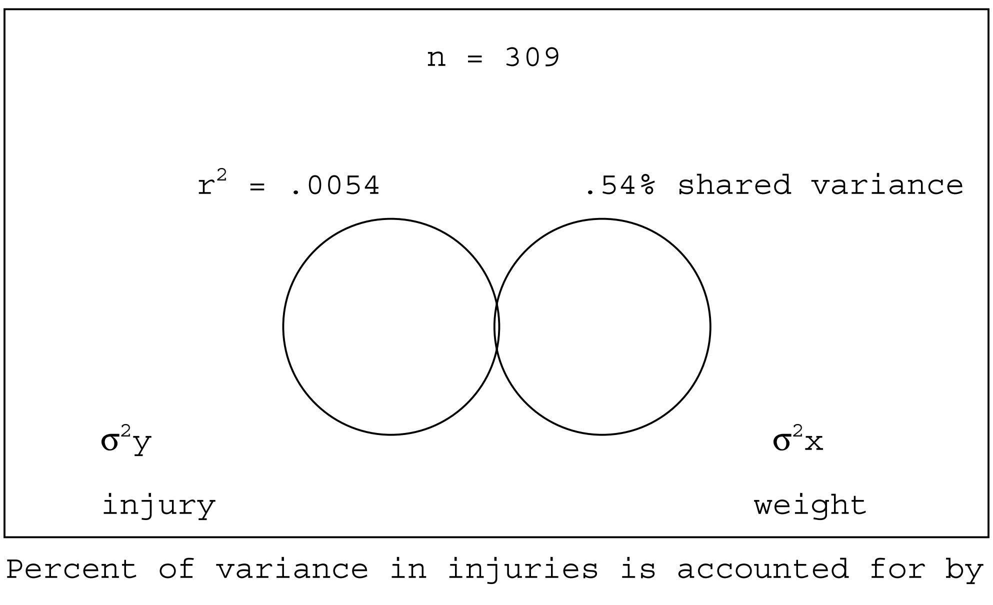
Percent of variance in injuries is accounted for by the variance of push-up score



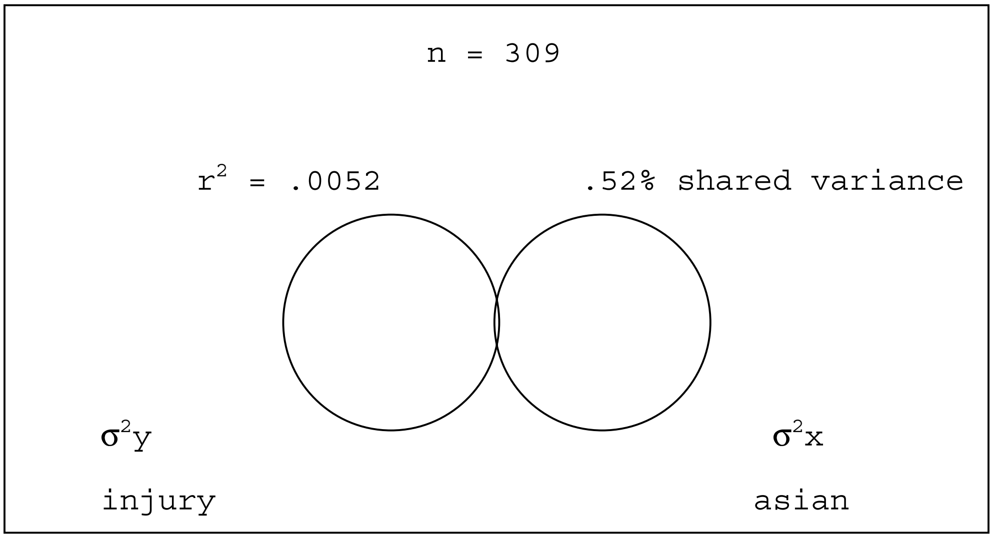
Percent of variance in injuries is accounted for by the variance of PT run score



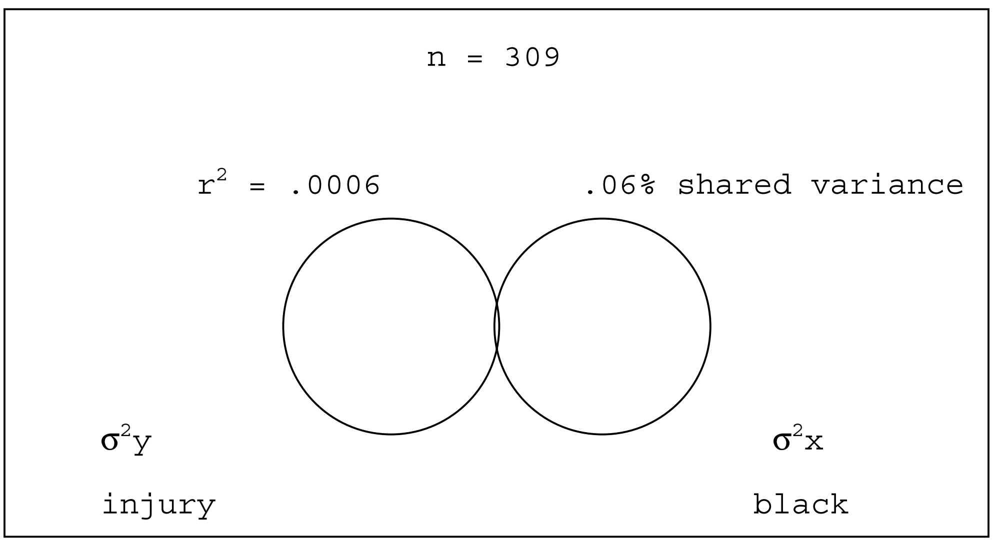
Percent of variance in injuries is accounted for by the variance of cumulative PT score



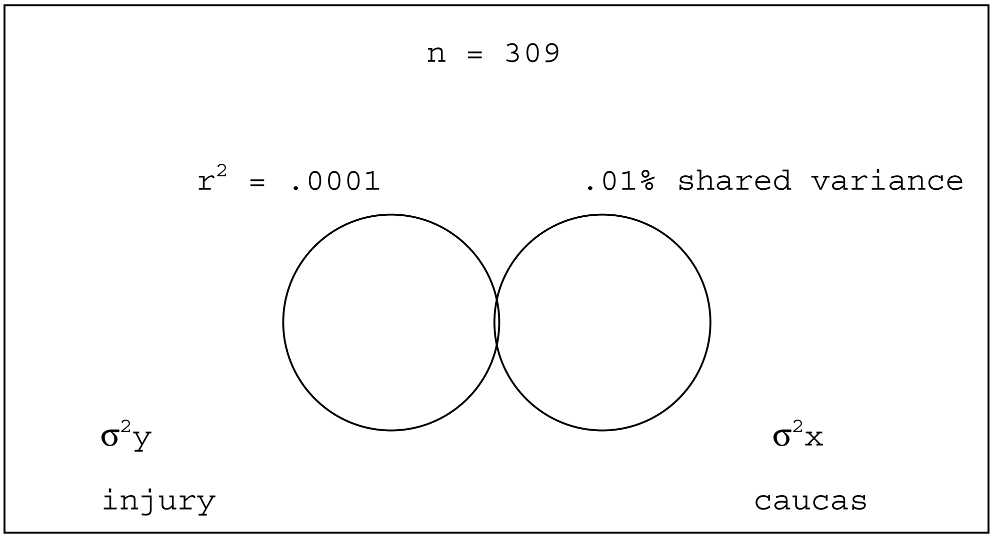
Percent of variance in injuries is accounted for by the variance of overweight status at initial physical



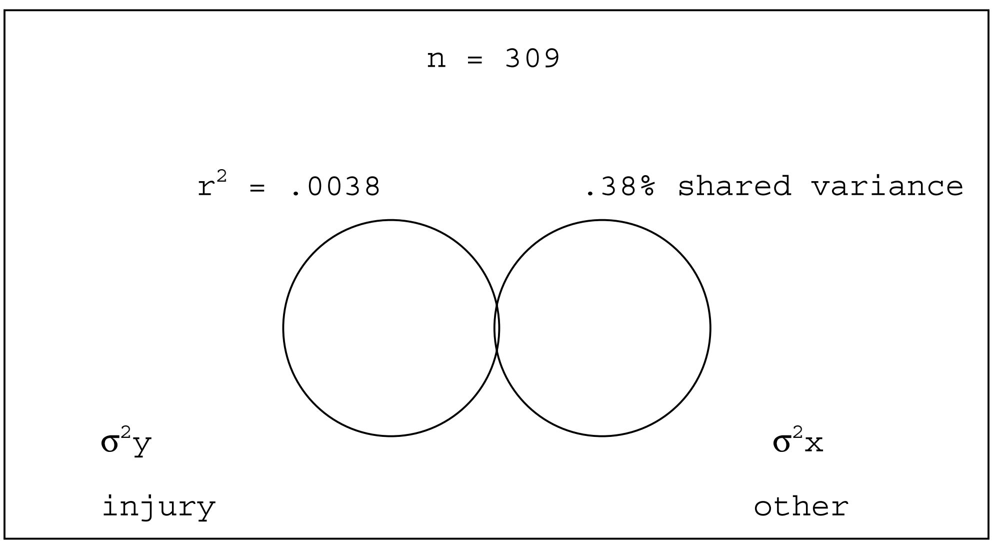
Percent of variance in injuries is accounted for by the variance of race (Asian)



Percent of variance in injuries is accounted for by the variance of race (Black)



Percent of variance in injuries is accounted for by the variance of race (Caucasian)



Percent of variance in injuries is accounted for by the variance of race (Other)

References

Almeida, S. A., Williams, K. M., Shaffer, R. A. & Brodine, S. K. (1999). Epidemiological patterns of musculoskeletal injuries and physical training. Medicine & Science in Sports & Exercise, 31(8), 1176-1182.

Bush, R. A., Brodine, S. K., & Shaffer, R. A. (2000). The association of blisters with musculoskeletal injuries in male marine recruits. Journal of the American Podiatric Medical Association, 90(4), 194-198.

Cox, K. A., Clark, K. L., Li, Y., Powers, T. E., & Krauss, M. R. (2000). Prior knee injury and risk of future hospitalization and discharge from military service. American Journal of Preventive Medicine, 18 (3 Supplemental), 112-117.

Deuster, P. A. & Jones, B. H. (1997). Patterns and risk factors for exercise-related injuries in women: a military perspective. Military Medicine, 162, 649-655.

Edwards, A. L. (1976). An Introduction to Linear Regression and Correlations (2d ed.). (pp. 192-200). New York: W. H. Freeman and Company.

Finestone, A. S., Eldad, A., & Milgrom, C. (2000). Pre-induction sport activity in prevention of stress fractures in elite infantry recruits. Harefuah, 138(9), 719-722.

Garcia, J. E., Grabhorn, L. L., & Franklin, K. J. (1987). Factors associated with stress fractures in military recruits. Military Medicine, 152, 45-48.

Gardner Jr., L. I., Dziados, J. E., Jones, B. H., Brundage, J. F., Harris, J. M., Sullivan, R., & Gill, P. (1988). Prevention of lower extremity stress fractures: A controlled trial of shock absorbent insole. American Journal of Public Health, 78(12), 1563-1567.

Henderson, N. E., Knapik, J. J., Shaffer, S. W., McKenzie, T. H., & Schneider, G. M. (2000). Injuries and injury risk factors among men and women in U.S. army combat medic advanced individual training. Military Medicine, 165, 647-652.

Ivanovski, A., Medjedovic, D., & Perisic, V. (1998). Fractures of the metatarsal bones caused by fatigue. Srpski Arhiv Za Celokupno Lekarstvo, 126(3-4), 107-110.

Jones, B. H. (1983). Overuse injuries of the lower extremities associated with marching, jogging and running: a review. Military Medicine, 148, 783-787.

Jones, B. H., Bovee, M. W., Harris III, J. McA., & Cowan, D. N. (1993). Intrinsic risk factors for exercise-related injuries among male and female army trainees. The American Journal of Sports Medicine, 21(5), 705-710.

Jones, B. H., Cowan, D. N., Tomlinson, J. P., Robinson, J. R., Polly, D. W. & Frykman, P. N. (1993). Epidemiology of injuries associated with physical training among young men in the army. Medicine and Science in Sports and Exercies, 25(2), 197-203.

Jones, B. H., & Knapik, J. J. (1999). Physical training and exercise-related injuries. Surveillance, research and injury prevention in military populations. Sports Medicine, 27(2), 111-125.

Kaufman, K. R., Brodine, S., & Shaffer, R. (2000). Military training-related injuries: surveillance, research, and prevention. American Journal of Preventive Medicine, 18(3 Supplemental), 54-63.

Knapik, J. J., Reynolds, K., & Barson, J. (1999). Risk factors for foot blisters during road marching: Tobacco use, ethnicity, foot type, previous illness, and other factors. Military Medicine, 164(2), 92-97

Lee, L., Kumar, S., Kok, W. L., & Lim, C. L. (1997). Effects of a pre-training conditioning programme on basic military training attrition rates. Annals of the Academy of Medicine, Singapore, 26(1), 3-7.

Milgrom, C., Simkin, A., Eldad, A., Nyska, M. Finestone, A. S. (2000). Using bone's adaptation ability to lower the incidence of stress fractures. American Journal of Sports Medicine, 28(2), 245-251.

Piantanida, N. A., Knapik, J. J., Brannen, S., & O'Connor, F. (2000). Injuries during Marine Corps officer basic training. Military Medicine, 165(7), 515-520.

Popovich, R. M., Gardner, J. W., Potter, R., Knapik, J. J., & Jones, B. H. (2000). Effect of rest from running on overuse injuries in army basic training. American Journal of Preventive Medicine, 18(3 Supplemental), 147-155.

Powell, K. E., Fingerhut, L. A., Branche, C. M., & Perrotta, D. M. (2000). Deaths due to injury in the military. American Journal of Preventive Medicine, 18(3 Supplemental), 26-32.

Reynolds, K. L., White, J. S., Knapik, J. J., Witt, C. E., & Amoroso, P. J. (1999). Injuries and risk factors in a 100-mile (161-km) infantry road march. Preventive Medicine, 28(2), 167-173.

Ross, J., & Woodward, A. (1994). Risk factors for injury during basic military training: Is there a social element to injury pathogenesis? Journal of Medicine, 36(10), 1120-1126.

Sanders, H. D. (1995). Statistics: a first course (5th ed., pp. 275-327). New York: McGraw-Hill.

Schmidt Brudvig, T. J., Gudger, T. D., & Obermeyer, L. (1983). Stress fractures in 295 trainees: A one-year study of incidence as related to age, sex, and race. Military Medicine, 148(2), 666-667.

Schneider, G. A., Bigelow, C., & Amoroso, P. J. (2000). Evaluating risk of re-injury among 1214 army airborne soldiers using a stratified survival model. American Journal of Preventive Medicine, 18(3 Supplemental), 156-163.

Scully, T. J. & Besterman, G. (1982). Stress fracture – a preventable training injury. Military Medicine, 147, 285-287.

Smith, G. S., Dannenberg, A. L., & Amoroso, P. J. (2000). Hospitalization due to injuries in the military. Evaluation of current data and recommendations on their use for injury prevention. American Journal of Preventive Medicine, 18(3 Supplemental), 41-53.

Snoddy, R. O., Jr., & Henderson, J. M. (1994). Predictors of basic infantry training success. Military Medicine, 159, 616-622.

Tomlinson, J. P., Lednar, W. M., & Jackson, J. D. (1987). Risk of injury in soldiers. Military Medicine, 152(2), 60-64.